For Macintosh Programmers

MacTech

MAGAZINE

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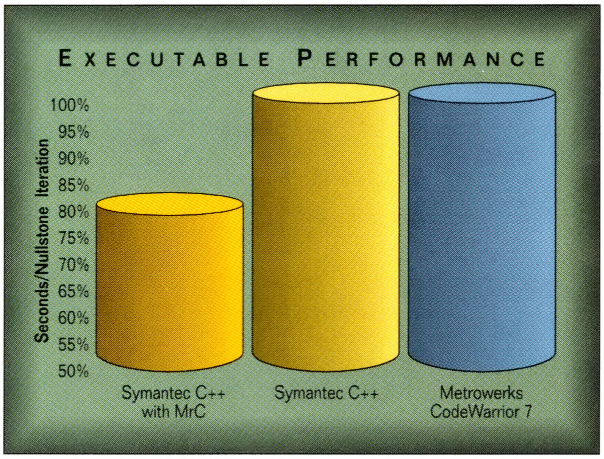

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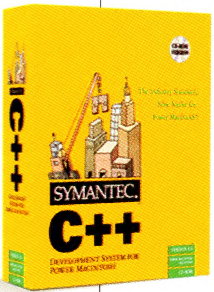

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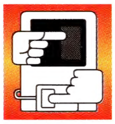

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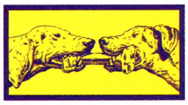

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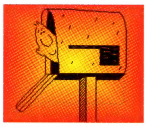

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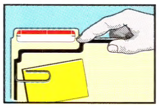

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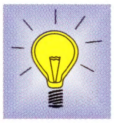

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GETTING STARTED

By Dave Mark

A Java Popup Menu URL Launcher

Since last month's column, I've been consumed with Java. I've been reading every Java book I could get my hands on, including the galleys for *Learn Java on the Macintosh* (Addison-Wesley), *Java in a Nutshell* (O'Reilly & Associates), *Active Java* (Addison-Wesley), *Java Essentials for C and C++ Programmers* (Addison-Wesley), and *Teach Yourself Java for Macintosh In 21 Days* (Hayden). There are lots of Java books out there, some of them much better than others.

Beware of Java books written to pre-release versions of the Java SDK from Sun. Much has changed between the pre-release and release versions and, as a slew of messages on the net will attest, those changes will frustrate you as you attempt to get the book sample code to work.

The applets from *Learn Java on the Macintosh* and *Java in a Nutshell* have been translated into Metrowerks' Java project format. You can download the applets from Metrowerks' Web site (www.metrowerks.com).

THIS MONTH'S APPLETS

One important use of Java is to extend the functionality of a Web site, beyond the capabilities offered by HTML. If you've ever been to Netscape's Web site, you've probably encountered the long list of download sites that allow you to download the latest version of a Netscape product (Figure 1).

If you've got a long list of URLs to put on your Web site, you can, of course, represent them just like Netscape did, as a long series of links. The downside to this approach is that the links can take up a fair amount of screen space. An alternative is to use a form CGI and represent the list as a popup menu of URLs.

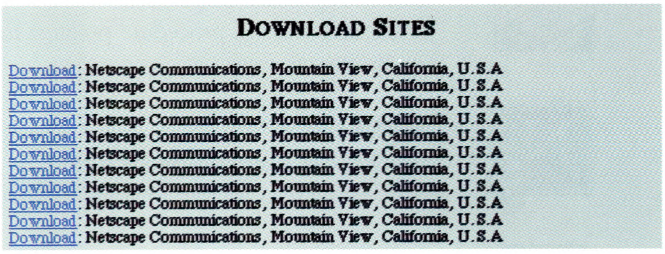

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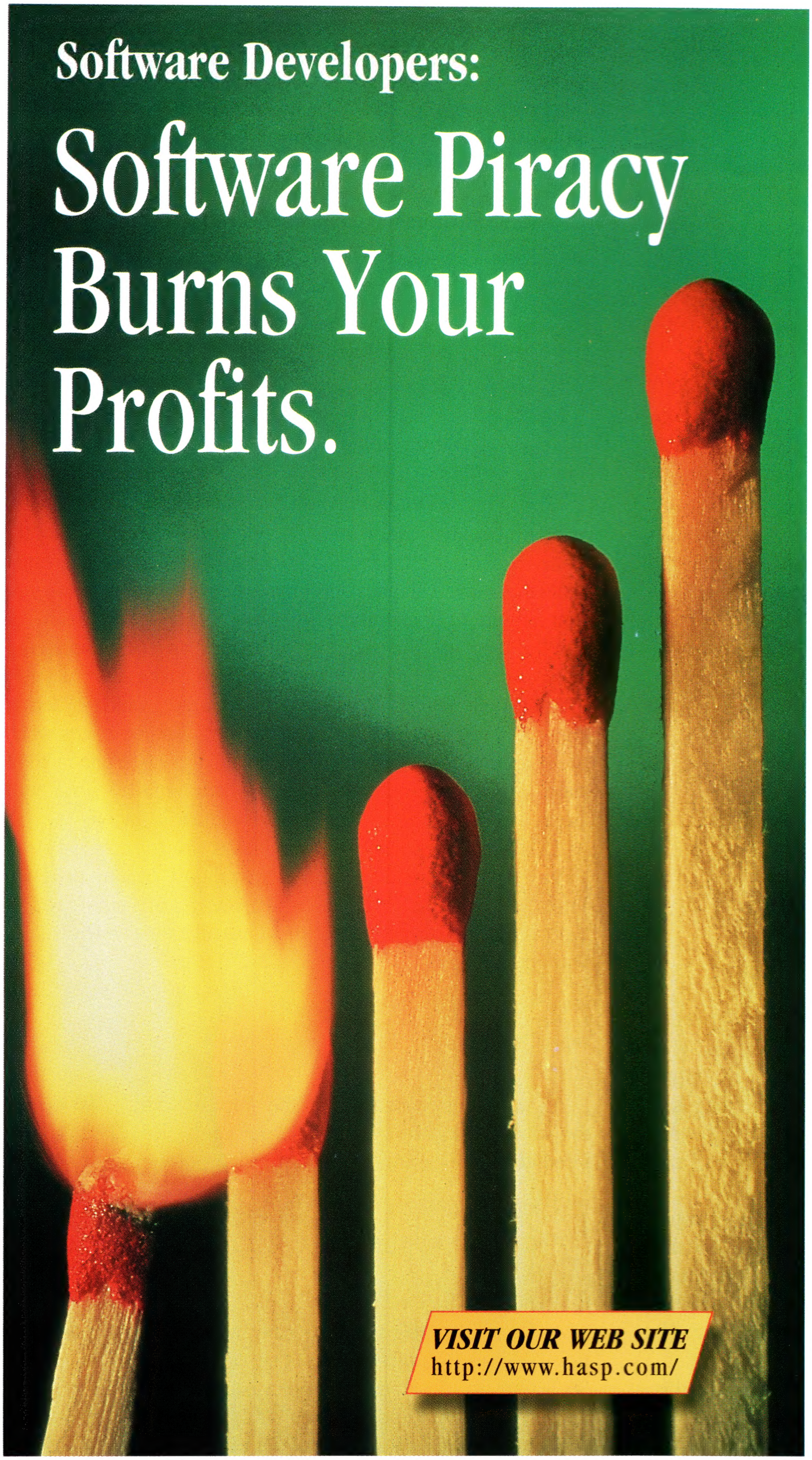
Figure 1. The long list of sites to download the latest version of Netscape Navigator

Solving the problem using a CGI is fine, but I wanted to implement this "popup" solution as a Java applet instead. To do this, we need to take advantage of the existing Java applet model, as embodied in the `java.applet.Applet` class. To make this a little easier to understand, I developed the applet in two stages. Here's the first version:

```
import java.applet.*;
import java.awt.*;
import java.net.*;

public class popup extends Applet
{
  private Choice  urlChoices;
  int          numURLs;

  public voidinit()
  {
    this.setBackground( Color.yellow );//java.awt.Color
    this.setForeground( Color.red );//java.awt.Color

    urlChoices = new Choice();

    urlChoices.addItem( "www.metrowerks.com" );
    urlChoices.addItem( "www.netscape.com" );
    urlChoices.addItem( "www.mactech.com" );

    urlChoices.setForeground( Color.green );
    urlChoices.setBackground( Color.blue );

    this.add( new Label( "Select URL: " ) );
    this.add( urlChoices );
  }

  public boolean action( Event e, Object obj )
  {
```



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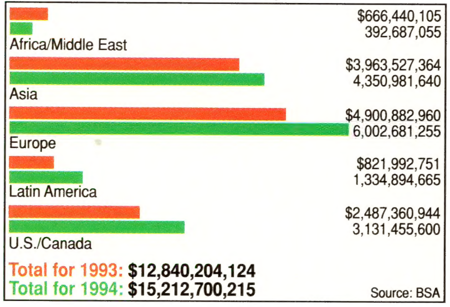

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```
    URL    url;

    if ( e.target == urlChoices )
    {
      try
      {
        url = new URL( obj.toString() );
      }
      catch( MalformedURLException err )
      {
        // Could print error message here.
        return true;
      }
      this.getAppletContext().showDocument( url );
      return true;
    }
    else
      return super.action( e, obj );
  }
}
```

Since I'm using CodeWarrior, I started by creating a new project file called `popup.μ` using the Java applet stationery. Next, I created a new source code file named `popup.java` and added it to the project. I typed in my source code, saved it, then selected the `.java` file in the project window and compiled it. The compiler used my Java source code to produce a file named `popup.class` which contains the Java byte code that will be loaded by my HTML file.

Speaking of my HTML file, I used CodeWarrior to create a new file called `popup.html` and saved it in the same folder as my other project files. I *didn't* add the HTML file to the project. Here's the HTML:

```
<HTML>
<HEAD>
<TITLE>URL Launcher</TITLE>
</HEAD>
<BODY>
This applet creates a popup menu of URLs.
<HR>
<APPLET CODE="popup.class" WIDTH=300 HEIGHT=35>
</APPLET>
</BODY>
</HTML>
```

If you've never seen HTML before, it's pretty straightforward. Basically, your HTML file contains the text you want to appear on your Web page, with a bunch of "tags" sprinkled throughout that define how the text looks. A tag is a pair of angle brackets that enclose a tag name, along with optional tag attributes. Some tags work in pairs. An end tag always starts with a `'/'`.

For example, to define the title of a particular page, you'll start with the `<title>` tag, follow it with the title, then follow the text with the `</title>` tag. The `<hr>` tag places a horizontal rule on your page. Note that the `<hr>` tag doesn't require a corresponding `</hr>` tag, since there is no text that needs to be surrounded. By the way, HTML tags are case-insensitive.

The `<applet>` tag is the tag we're interested in in this column. The `CODE` attribute specifies the name of the class file we want launched. In this case, we want the Java byte codes in `popup.class` executed.

Drag the HTML file on top of your favorite Java applet runner. If you have a Java-capable browser (like Netscape Atlas), you can open the HTML file and see how your applet looks on an actual Web page. Alternatively, if you run the applet using an applet runner, you'll see the applet portion of the Web page only. Most applet runners only understand the applet tag and will ignore the rest of the HTML.

Figure 2 shows the popup applet as viewed in an early beta of Netscape Atlas. As long as your Internet connection is live, selecting a URL from the popup menu transfers you to that URL.

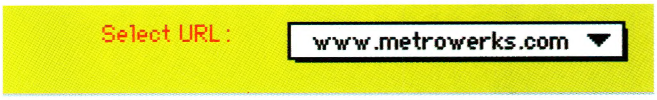


Figure 2. Our popup applet in action

Let's take a look at the source code...

THE POPUP.JAVA SOURCE CODE

As I already mentioned, this applet extends the `java.applet.Applet` class. Go into the API Documentation folder that came with your development environment and use your Web browser to open the file `java.applet.Applet.html`. As you'll see in the figure at the top of the page, `java.applet.Applet` is derived from `java.awt.Panel`, which is derived from `java.awt.Container`, which is derived from `java.awt.Component`. `java.awt.Component` is where all the action is. That's where you'll find all the interesting methods used by most applets. Spend a little quality time with `java.awt.Component.html`. It will definitely pay off.

The first few lines make the classes in `java.applet.*`, `java.awt.*`, and `java.net.*` available to our program. This allows us to refer to `Applet` instead of `java.applet.Applet` and `URL` instead of `java.net.URL`. You get the idea.

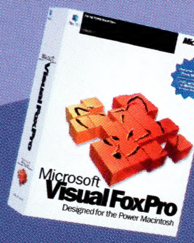
```
import java.applet.*;
import java.awt.*;
import java.net.*;
```

Our popup class extends the `Applet` class. We declare the variable `urlChoices` inside our class. `urlChoices` is a reference to a `Choice` (Java's term for a popup menu).

```
public class popup extends Applet
{
  private Choice  urlChoices;
```

The first method in our applet is the `init()` method. `init()` will be called automatically when our applet is started up. We'll use this method to set up our `Choice` popup menu. We'll start off by setting the applet background color to yellow and the foreground color to red. Note that `this` refers to the applet. If you take a look at Figure 2, you'll see that the background is yellow and that the popup menu's label text is red. I know yellow and red might not be a particularly good looking combination, but it does make the point, right?

Ever since Fred got the new Visual FoxPro for Power Macintosh, he catches the Frisbee every time.



And perhaps more importantly, he also gets his work done in record time. Thanks to Microsoft® Visual FoxPro™ 3.0 for Power Macintosh,® one might say that Fred's productivity is positively soaring.

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```
  public voidinit()
  {
    this.setBackground( Color.yellow );//java.awt.Color
    this.setForeground( Color.red );//java.awt.Color
```

The next line uses `new` to create a new `Choice` object. Note that `urlChoices` is set to null until the new `Choice` is created.

```
    urlChoices = new Choice();
```

Next, the `Choice` classes' `addItem()` method is called to add three URLs to the project. The popup menu's foreground and background colors are set, too, but these calls don't seem to have any effect.

```
    urlChoices.addItem( "www.metrowerks.com" );
    urlChoices.addItem( "www.netscape.com" );
    urlChoices.addItem( "www.mactech.com" );

    urlChoices.setForeground( Color.green );
    urlChoices.setBackground( Color.blue );
```

Finally, a new `Label` object is created and the `Label` and `Choice` objects are added to the applet.

```
    this.add( new Label( "Select URL: " ) );
    this.add( urlChoices );
  }
```

The `action()` method is called whenever an event occurs that relates to the applet. We'll declare a `URL` reference to hold the URL we want to transfer to.

```
  public boolean action( Event e, Object obj )
  {
    URL   url;
```

The `Event` object `e` contains the event description we are responding to. Check out `java.awt.Event` to get a sense of Java event handling. `e.target` specifies the target object of the event. If the target is our popup menu, `urlChoices`, we'll handle the event. Otherwise, we'll pass the event on to our superclass and return whatever value `super.action()` returns.

If `urlChoices` was the target, we'll try creating a new `URL` object. Some Java objects require that you catch exceptions thrown by the object. To get a sense of this, go to the `java.net.URL.html` page. Note that all of the constructors throw the `MalformedURLException` error. You must catch this exception or your code won't compile. We ignore the error, but we could print an error message or, better yet, put up a dialog letting users know that the URL they selected isn't quite right.

If you throw an exception, you'll create a new `java.lang.exception` object (or some class that extends `throwable`). But when you catch an exception, the exception object is passed to your `catch` block, as `err` was in this case. Take a look at `java.lang.Throwable.html`, especially the `getMessage()` method.

```
    if ( e.target == urlChoices )
    {
      try
      {
```

Since the event target is our popup menu, the object will be the menu itself. By calling the method `toString()` (inherited from `Object`), we'll get a string with the popup menu's current setting. We'll then use that string to initialize the `URL`.

```
        url = new URL( obj.toString() );
      }
      catch( MalformedURLException err )
      {
        // Could print error message here.
        return true;
      }
```

Assuming the `URL` object was created okay, we'll call `getAppletContext()` to get our applet's context, then use that object to call `showDocument()`, which will tell our browser to jump to a different URL.

```
      this.getAppletContext().showDocument( url );
      return true;
    }
    else
      return super.action( e, obj );
  }
}
```

SAME APPLET, USING PARAMETERS

Here's a second version of the applet that gets its URLs from the HTML file. To see how this works, take a look at the second version of our HTML file:

```
<HTML>
<HEAD>
<TITLE>URL Launcher</TITLE>
</HEAD>
<BODY>
This applet takes a series of parameters and turns them into
a popup menu of URLs. The PARAM with the name numURLs tells
you how many URLs are included. PARAM "1" contains the 1st
URL, PARAM "2" contains the next URL, etc.
<HR>
<APPLET code="popup.class" width=300 height=35>
<PARAM name="numURLs" value="3">
<PARAM name="1" value="http://www.metrowerks.com">
<PARAM name="2" value="http://www.mactech.com">
<PARAM name="3" value="http://www.netscape.com">
</APPLET>
</BODY>
</HTML>
```

Notice that we've added a series of `<PARAM>` tags between the `<APPLET>` and `</APPLET>` tags. Each `PARAM` passes a named parameter to our applet. The `numURLs` parameter tells our applet how many URLs we are passing in. The `1` parameter contains the first URL, `2` contains the second URL, etc.

Here's the second version of our applet:

```
import java.applet.*;
import java.awt.*;
import java.net.*;

public class popup extends Applet
```

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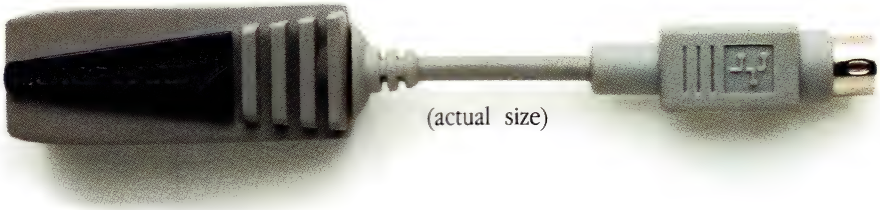

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Mac™OS

Pirate Busters

```
{
  private Choice  urlChoices;

  public voidinit()
  {
    int    numURLs = 0;

    this.setBackground( Color.yellow );//java.awt.Color
    this.setForeground( Color.red );//java.awt.Color

    urlChoices = new Choice();

    urlChoices.setForeground( Color.green );
    urlChoices.setBackground( Color.blue );

    String numURLsString = this.getParameter( "numURLs" );

    if ( numURLsString == null )
    {
      this.showStatus( "null or missing numURLs Parameter!"
);
    }
    else
    {
      try
      {
        numURLs = Integer.parseInt( numURLsString );
      }
      catch( NumberFormatException err )
      {
        numURLs = 0;
        this.showStatus( "Bad numURLs Parameter: " +
                         numURLsString );
      }

      String   urlString;

      for ( int i=1; i<=numURLs; i++ )
      {
        urlString = this.getParameter( Integer.toString( i )
);

        if ( urlString == null )
          this.showStatus( "Missing Parameter: " + i );
        else
          urlChoices.addItem( urlString );
      }
    }

    this.add( new Label( "Select URL: " ) );
    this.add( urlChoices );
  }

  public boolean action( Event e, Object obj )
  {
    URL    url;

    if ( e.target == urlChoices )
    {
      try
      {
        url = new URL( obj.toString() );
      }
      catch( MalformedURLException err )
      {
        // Could print error message here.
        return true;
      }
      this.getAppletContext().showDocument( url );
      return true;
    }
    else
      return super.action( e, obj );
  }
}
```

Basically, the difference here is in this chunk of code from `init()`:

```
    String numURLsString = this.getParameter( "numURLs" );

    if ( numURLsString == null )
    {
      this.showStatus( "null or missing numURLs Parameter!"
);
    }
    else
    {
      try
      {
        numURLs = Integer.parseInt( numURLsString );
      }
      catch( NumberFormatException err )
      {
        numURLs = 0;
        this.showStatus( "Bad numURLs Parameter: " +
                         numURLsString );
      }

      String   urlString;

      for ( int i=1; i<=numURLs; i++ )
      {
        urlString = this.getParameter( Integer.toString( i )
);

        if ( urlString == null )
          this.showStatus( "Missing Parameter: " + i );
        else
          urlChoices.addItem( urlString );
      }
    }

    this.add( new Label( "Select URL: " ) );
    this.add( urlChoices );
```

We start by calling `getParameter()` to retrieve the `numURLs` parameter. If the parameter is missing, we call `showStatus()` to display an error message in the browser's status message area. If the parameter was there, we'll try parsing an integer value from the string, placing the value in `numURLs`. Assuming we get a proper number, we'll step from 1 to `numURLs`.

Inside the loop, we'll convert the current index into a string (using `Integer.toString()`) and pass that string into `getParameter()`. If that parameter exists, we'll add that parameter into the popup menu.

TILL NEXT MONTH...

Want more Java? Want more PowerPlant? Want some TCL? What the heck *do* you want? Send me some email. Let me know. Otherwise, I'll just keep writing about Java until I get sick of it! <g> By the way, I hope that you will take a moment and visit www.zumacafe.com, the Web site for a brand new internet cafe in Santa Fe, New Mexico. Zuma's is the brainchild of Robin Williams, a brilliant writer and someone who has given a great deal to the Macintosh community. Check out the site and, if you get to Santa Fe, drop by Zuma's and say hello!

AppMaker

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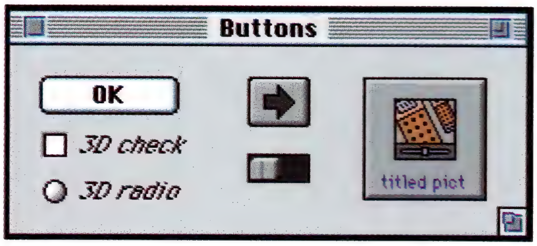

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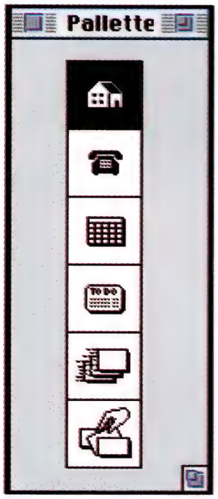
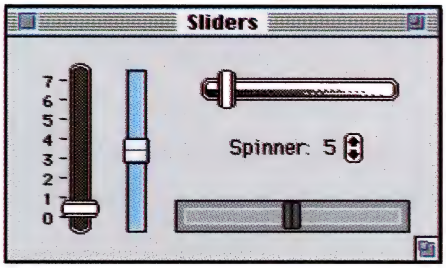


It's like having an expert assistant working for you. Use it as a prototyping and productivity tool. You concentrate on the unique features of your application instead of the standard parts. Novices read the AppMaker code to learn Macintosh programming techniques.



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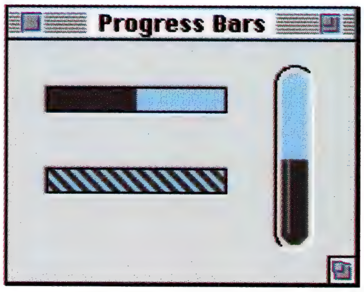
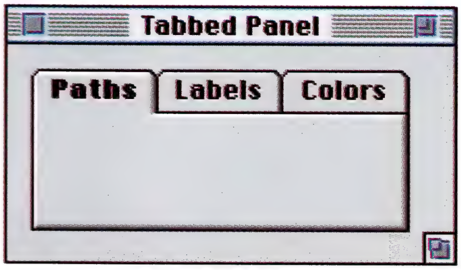


AppMaker also supports CodeWarrior PowerPlant, procedural C, and PowerMac development. A single AppMaker document can now generate code and resources for a wide variety of languages, frameworks, and eventually, platforms.



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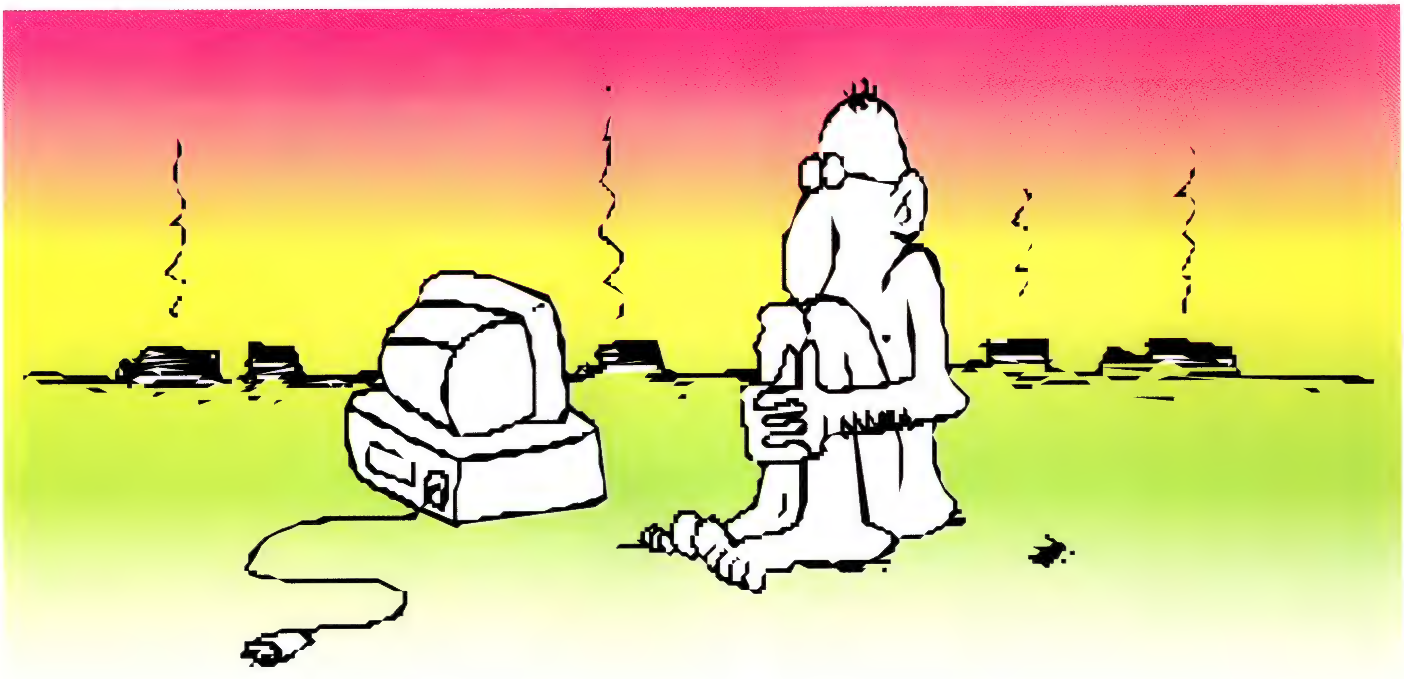

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By Rich Parker

Symantec C++ v8 Release 5

A lot more than its Caffeine is eye-opening

ABOUT SYMANTEC'S NEW RELEASE

Symantec C++ version 8 release 4 was the beginning of Symantec's new subscription program for this product. I described it in considerable detail in my article, "New Symantec Development Tools" (*MacTech Magazine* 11.12 [December 1995] 43–50), and I'm not going to repeat all of that here.

Doubtless you're interested in what's new with Symantec C++ and the Symantec Project Manager (SPM), and there's lots to report on that front. The new SPM has a *much* smaller footprint. The previous version required about 12MB of RAM to run; the new version contained in this release has a preferred size of 6.5MB. That's a reduction of almost 50%! In addition, the new version requires less system temporary memory for precompiled headers, and that space is managed much more efficiently.

Another big step forward with the new release of the SPM is that you can develop both 68K and Power Mac applications from the *same* project file. This is a *huge* advantage for those of us who had to keep two project files and try to keep them both up to date.

There have been bug fixes and other changes to the Visual Architect and the TCL in this new version. I'm not aware of any new classes, but the existing classes have been made even more robust. One thing that users of Object I/O will appreciate is the inclusion of the "Using Object I/O" document, which goes into a quite a lot of detail about how this feature works and how it can be added easily to your application's classes. The document is in Acrobat format inside the "Documentation" folder, within the "EIC" folder of the "Symantec C++ for Power Mac" folder.

In addition to the "Latest Symantec Tools" folder's contents, there are quite a number of Apple software products included in the new release. There is a complete hard-disk-ready copy of MPW v3.4, including all of its compilers and tools, the latest version of MacApp (3.3), ToolServer, SourceServer, Apple debuggers, ResEdit, and a "SOM Objects for Mac OS" folder that contains the shared library, plus Apple's statement of direction in their development plans. Code, interfaces, and examples for MPW are also included, and there are interfaces and libraries for QuickDraw 3D and drivers and interfaces for the PCI bus. There are a lot of additional Apple components that I haven't mentioned.

BUT WAIT, THERE'S MORE…

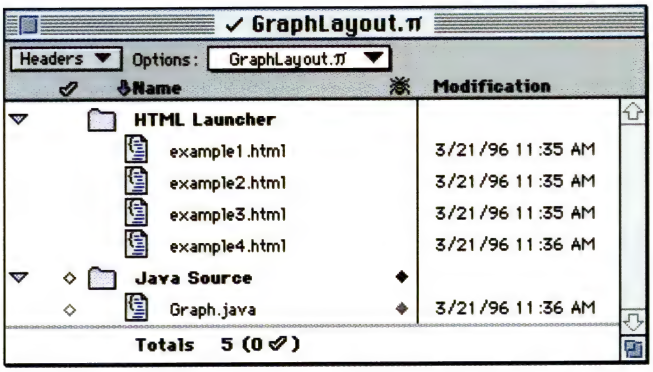
Release 5 includes Caffeine, a translator plug-in that supports the development of Java Applets with the SPM. You will need to use the Custom Install option to install Caffeine, which also installs Sun Microsystems' Java compiler and Applet Viewer code, as well as a ton of examples.

Caffeine is a prelude to the announcement of Café for the Macintosh, a stand-alone development environment for Java applets and applications. Symantec delivered Espresso for the Windows platform last December. This, like Caffeine, was a plug-in feature for their v7.21 C++ development environment. Symantec released the stand-alone version of Café for Windows late in March and expects to release Café for the Mac some time soon – perhaps it will have been released as you read this review. [*As indeed it was. While Rich, at our urging, was madly laboring to cover Caffeine in timely fashion, Café for Mac burst upon the scene, to be sent free to all Symantec C++ subscribers – thus truly superseding Caffeine. The rapidity of events is proving somewhat overwhelming. Nonetheless, we have not excised Rich's discussion, as it would have been wrong to rob our readers of its cogency and inherent interest. – man*]

For author information, see "Tools Plus 3.0", p. 52.

At this point, Caffeine relies on version 1.0b1 of Sun's Java Development Kit (JDK). That kit has some outstanding problems, not the least of which is that audio files aren't supported. There are also other bugs in Sun's software. I'm told that Sun intends to release the second beta version of their JDK sometime in April, and that the audio problem, among others, is solved.

Even though Sun's software is not quite up to par at this point, you can still develop applets that will run quite well with Java-equipped Internet browsers, or with the included Applet Viewer. To give you an idea of a Java applet, Figure 1 illustrates a typical SPM project file window for Java applet development.



✓	Name		Modification
	HTML Launcher		
	example1.html		3/21/96 11:35 AM
	example2.html		3/21/96 11:35 AM
	example3.html		3/21/96 11:35 AM
	example4.html		3/21/96 11:36 AM
◇	Java Source	◆	
◇	Graph.java	◆	3/21/96 11:36 AM
	Totals 5 (0 ✓)		

Figure 1. SPM project for Java development

As you can see from Figure 1, a Java project includes one or more HTML files and a Java source file. The various HTML files can be used to supply different sets of parameters to the Java applet. To compile the project, choose **Bring Up To Date** from the **Build** menu. This causes the SPM to invoke Sun's Javac compiler to compile the source file (in this case, `Graph.java`). When the compilation is complete, the compiled classes are stored inside the "Classes" folder of the "MacJDL 1.0b1" folder that was installed when you installed Caffeine. I compiled several of the examples and all of the compiled classes are just lumped together in that one folder. It would have been better if they were separated into individual folders, by project name. To execute the applet, you need either to move all of the classes and the HTML files into the place where your Internet browser expects to see them, or to leave them where they are and choose the **Run Applet (example1.html)** command from the **AppleScript** menu. This will cause the Applet Viewer application to be invoked with the "example1.html" file. If you wish to see the results of running any of the other HTML files, then you'll have to either duplicate and modify the script to refer to "example2.html," "example3.html," and so forth, or open the individual HTML files from within the Applet Viewer, once it has been invoked. The result of running the "example1.html" file by choosing the **Run Applet** script is shown in Figure 2.

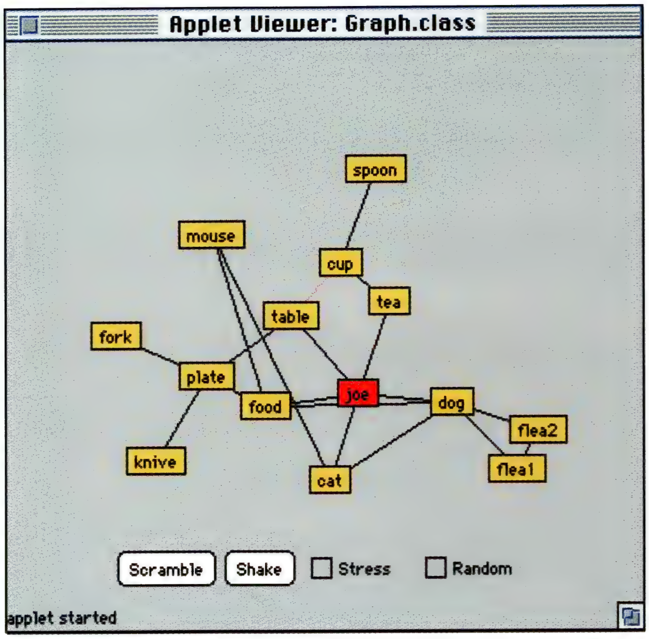
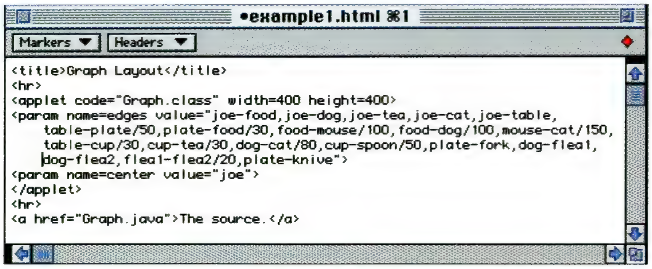


Figure 2. Graph layout applet in execution

The static picture in Figure 2 doesn't do the applet justice. The positions of the various nodes of the graph are set initially to random positions and then, during the applet's execution, the nodes eventually drift into a steady state, which is the point at which the figure was captured. If you click the **Scramble** button, then the node-locations are scrambled and the graph again drifts to a (perhaps different) steady state. The **Shake** button, when clicked, causes the nodes to be shaken up and down to reposition them, and then they gravitate to another steady state. The **Stress** and **Random** checkboxes cause the nodes to behave differently, although I'm not quite sure I understand the purpose of these settings. Nevertheless, the Graph Layout is only one of the many examples of dynamic Java applets that were written by Sun and included in Symantec's Caffeine release.

Figure 3 shows the contents of the "example1.html" file that was used to specify the parameters of the graph to the compiled applet. I arbitrarily chopped the `<param>` directive into multiple lines for purposes of showing the entire specification in the figure.



```
<title>Graph Layout</title>
<hr>
<applet code="Graph.class" width=400 height=400>
<param name=edges value="joe-food,joe-dog,joe-tea,joe-cat,joe-table,
    table-plate/50,plate-food/30,food-mouse/100,food-dog/100,mouse-cat/150,
    table-cup/30,cup-tea/30,dog-cat/80,cup-spoon/50,plate-fork,dog-flea1,
    dog-flea2,flea1-flea2/20,plate-knive">
<param name=center value="joe">
</applet>
<hr>
<a href="Graph.java">The source.</a>
```

Figure 3. Example1.html file's contents

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```
"DATA 'FKEY' (6) {
    $"514F A924 A873 3F3C"
    $"BF86 A98C 2057 2050"
    $"4868 0002 A8F6 4E75"
}; "
```

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JAVA

MACINTOSH

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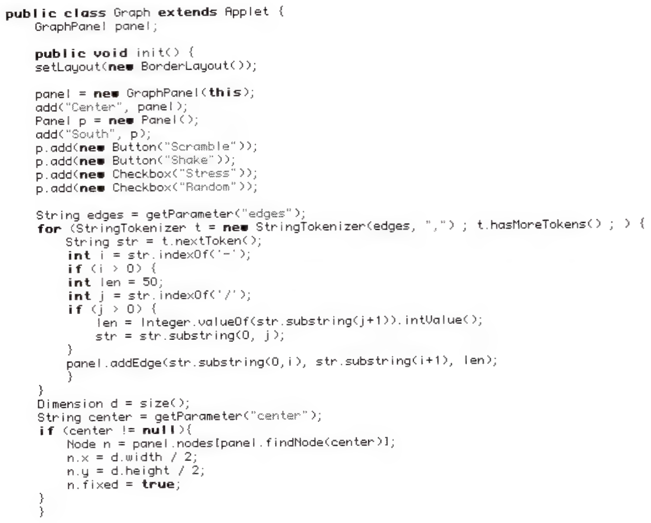
By this time, you're probably wondering what the Java source code looks like. I captured a portion of the code from the `Graph.java` source file, and it is shown in Figure 4.



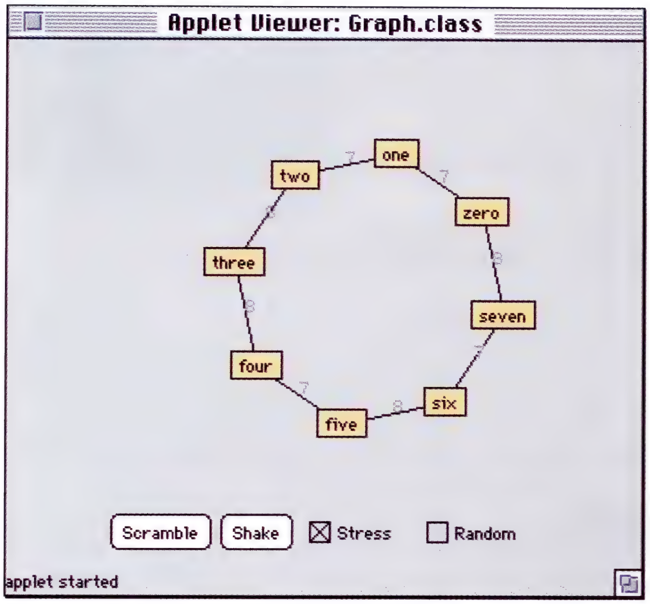
```
public class Graph extends Applet {
    GraphPanel panel;

    public void init() {
    setLayout(new BorderLayout());

    panel = new GraphPanel(this);
    add("Center", panel);
    Panel p = new Panel();
    add("South", p);
    p.add(new Button("Scramble"));
    p.add(new Button("Shake"));
    p.add(new Checkbox("Stress"));
    p.add(new Checkbox("Random"));

    String edges = getParameter("edges");
    for (StringTokenizer t = new StringTokenizer(edges, ",") ; t.hasMoreTokens() ; ) {
        String str = t.nextToken();
        int i = str.indexOf('-');
        if (i > 0) {
        int len = 50;
        int j = str.indexOf('/');
        if (j > 0) {
            len = Integer.valueOf(str.substring(j+1)).intValue();
            str = str.substring(0, j);
        }
        panel.addEdge(str.substring(0,i), str.substring(i+1), len);
        }
    }
    Dimension d = size();
    String center = getParameter("center");
    if (center != null){
        Node n = panel.nodes[panel.findNode(center)];
        n.x = d.width / 2;
        n.y = d.height / 2;
        n.fixed = true;
    }
    }
```

Figure 4. Portion of graph.java source code

The code shown in Figure 4 is just a sample of one function in the overall file. It shows how Symantec's built-in editor provides syntax coloring of keywords and character strings in the Java language. You can choose character styles and colors for language keywords, preprocessor directives, comments, string literals, and character constants. These choices are global and apply to these features for every language supported by the SPM.

One of the things that I really hate about Sun's Java code is the old-style statement formatting. I have campaigned for years against the old "Unix-style" statement formatting, and it seemed as though people were listening. More and more, code printed in magazines has been formatted for readability rather than for saving lines of code that took time to output on the old ASR 33 teletype printers. It really bothers me that Sun is creating a bad example that other Java programmers will tend to blindly follow. It isn't necessary to put the opening brace on the same line as the `if` statement, nor is it necessary to save lines by writing ugly code such as `} else {`. I just hope that programmers reading this review will think twice about the way that they format their own Java code. Please don't blindly follow Sun's lead.

That said, and having shown one example of the Graph Layout applet, I thought it would be useful to show the result of running the "example2.html" file, with the **Stress** checkbox selected. The source program does not need to be recompiled to use a different HTML file as input. Just open the "example2.html" file from within the Applet Viewer application (or from within your Internet browser, if you've installed the classes and HTML files where they belong). The result is shown in Figure 5.



applet started

Figure 5. Result of running example2.html

By running the example with the **Stress** checkbox checked, the nodes arrange themselves into a ring. The faint numbers on the lines connecting the nodes seem to be "weights" or "distances" that need to be preserved in this mode. Without the **Stress** checkbox checked, the nodes might arrange themselves into a number of different configurations. I've seen them in a figure-eight pattern.

MORE ABOUT JAVA

Although the Caffeine application doesn't support stand-alone applications, there is a lot that can be done with Java applets – as is amply demonstrated by the sophisticated examples. Sun's JDK includes the entire Java class library, including all of the AWT (Another Windowing Toolkit) classes, net (TCP/IP) classes, components (menubar, menu, container, scrollbar, window, dialog, panel, and so forth), as well as input/output classes, image classes, errors and exceptions, and many others. The Java class libraries are very well developed and seem to be mostly error-free. I've used the Windows version of Café to build a stand-alone application that has all of the elements of a standard application, except that it must still be executed with Sun's Java interpreter. This will undoubtedly be the case for the Mac version of Café when it is released.

The Java language is a kinder, gentler version of C++. There are no pointers in the new language, and applets are prevented from performing I/O on the user's machine. With the exception of the import of audio or graphic files, Java applets can be safely distributed on the net (at least that's the intention). Instead of requiring a "server-push" capability to provide dynamic Web pages, you'll be able to supply a Java applet that is transferred to the user's machine and executed by the Java-equipped Web browser (the released Mac version of the Netscape browser is still Java-challenged, but beta versions that offer Java support are available for download from Netscape's Web site). Java applets are also checked before they are executed to ensure that they don't try to wreak havoc on the user's machine.

The Windows version of the Netscape browser offers full Java applet execution. If you log on to Symantec's Café Web page, you'll see steam rising from the coffee cups that serve as bookends at the head of the page. This is accomplished by a Java applet that is downloaded to your machine automatically when you visit the page.

AND NOW BACK TO THE REVIEW

Symantec's SPM editor now includes drag-and-drop editing, proper opening and reading of files created with Unix, DOS, or Macintosh line-endings, and syntax coloring for all of the supported languages, including Java and PowerPC assembler files.

The Debugger has been improved to support deferred generation of debugging information. Applying this feature to files that you seldom debug can result in significant savings of disk space, as well as saving time during compilation.

The Visual Architect has been improved both by eliminating reported bugs and also by streamlining the user interface.

This release contains a set of highly interactive tutorials that guide you through the fundamental steps of using the Symantec development environment. Apple Guide files for four projects (Hello World, MiniEdit, Object Bullseye, and Beeper) are provided. These tutorials are accessible from the Guide menu whenever the Symantec project manager is running. In addition, there is a "Shortcuts & Tips" guide that is also accessible from the Guide menu. It provides useful information when using the Symantec Project Manager. The main page of the aforementioned guide is shown in Figure 6.

As you can see from the guide window in Figure 6, there is information on quite a number of topics. I chose the "Drag and drop" item and got the explanation shown in Figure 7.

The SPM now includes Apple's MrC and MrC++ translators for optimized compilation. You'll have to use the Custom Install option and choose the "Additional Drop-in Tools" category for these to be installed. In addition to the MrC and MrC++ translators, this category includes the Caffeine translator and the Sun SDK software, as well as Language Systems' LSPascal compiler. The new LSPascal compiler is still undergoing development; however, the version that is included in the current release is able to compile quite a number of applications, including the "NIH Image" image-editor demo program that is provided in the release. I understand that others have run into some problems with this version of the LSPascal compiler, so your mileage may differ.

In addition to the LSPascal translator, there is also a MacMindy translator that offers the ability to create Dylan applications for the Mac. Although the applications are interpreted, the MacMindy translator will give you the opportunity to play around with the Dylan language.

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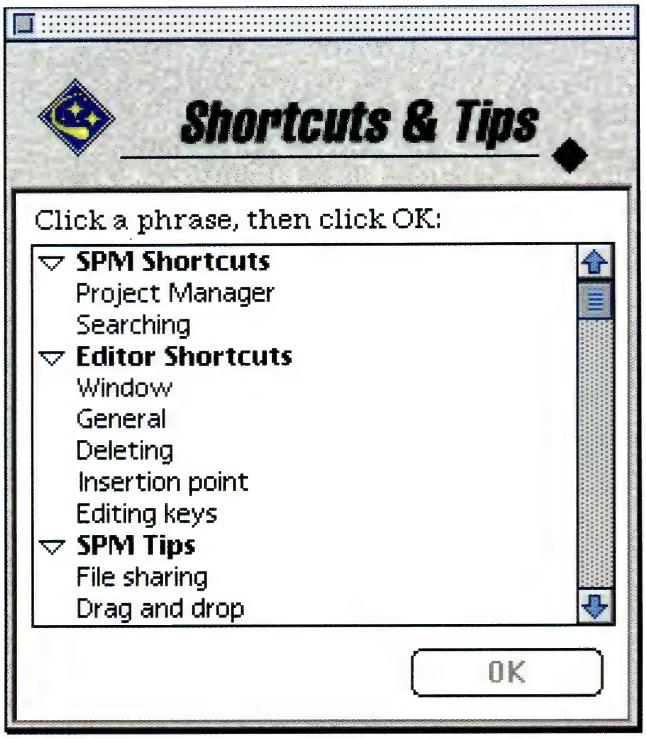
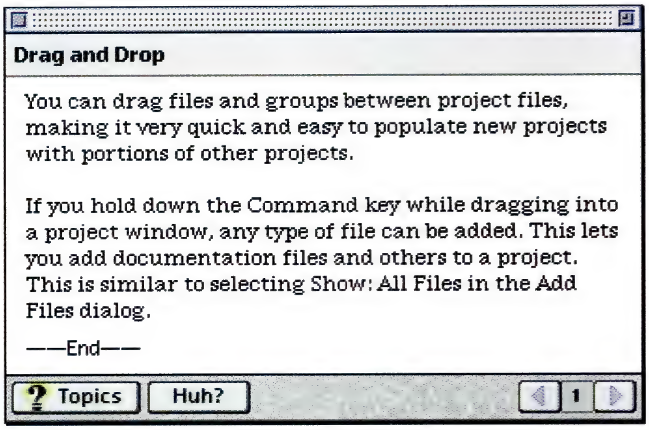


Click a phrase, then click OK:

- SPM Shortcuts
  - Project Manager
  - Searching
- Editor Shortcuts
  - Window
  - General
  - Deleting
  - Insertion point
  - Editing keys
- SPM Tips
  - File sharing
  - Drag and drop

Figure 6. Shortcuts & Tips guide



Drag and Drop

You can drag files and groups between project files, making it very quick and easy to populate new projects with portions of other projects.

If you hold down the Command key while dragging into a project window, any type of file can be added. This lets you add documentation files and others to a project. This is similar to selecting Show: All Files in the Add Files dialog.

——End——

Figure 7. Drag and Drop features

MORE ABOUT 68K AND POWER MAC DEVELOPMENT

The SPM provides a unified environment for PowerPC and 68K application development. A single project can be configured to target both architectures, using named sets of project and translator options. This allows the use of the same source code *and* the same project file to build your application. You have a choice of building a PowerPC, standard 68K, or CFM (Code Fragment Manager) 68K application, library, or shared library. You can even

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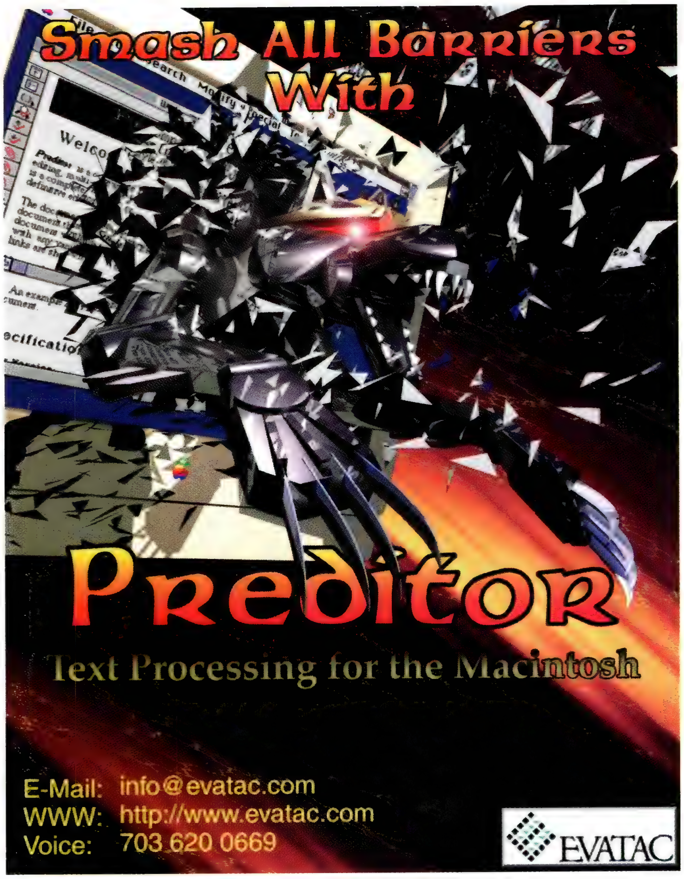

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choose to merge an already built 68K application into a PowerPC application, creating a fat application. The SPM itself is fat, as are the translators, the Visual Architect, and other tools.

The complete THINK Reference™ Viewer and databases are also included in this release. Although the references to the Macintosh toolbox aren't entirely up to date, THINK Reference is a must-have tool if you're programming with the Standard ANSI Libraries or the TCL. Apple's Macintosh Programmer's Toolbox Assistant doesn't cover those topics.

SYMANTEC GOODIES

Release 5 includes quite a number of additional "goodies" pertaining to the SPM. There is a "Compiler Toolkit" that explains how to host a new compiler within the SPM environment. The kit contains instructions and example projects. There's also information concerning external editors. If you have a personal editor preference, then you might be able to use it instead of the built-in SPM editor. Both Bare Bones Software's BBEdit and the Alpha shareware editor work well as external editors for the SPM. I've heard that Object Master also works in conjunction with the SPM, although there may be a problem with the SPM recognizing that files have been altered and need to be recompiled when that product is used.

The release also contains a folder full of scripts called "Do for Each Project," that perform operations such as "Remove Objects" on a set of projects. The Rainmaker Build Script provides an exhaustive log of the system features and memory usage during the build process. If you want to know everything about memory usage during compilation, then this script's for you.

An "SPM Color Manager" application provides the ability to change the SPM's default background and normal text colors. It's a FaceSpan application and comes with an installer and the FaceSpan extension.

There's source code too. The `CMoviePane` class offers the ability to show QuickTime movies in a pane. The `CColorBackground` and `CColorBorder` classes offer the ability to use color in the background or border of a window or dialog pane. And the `CDoubleText` class operates like the `CIntegerText` class, except that it handles text strings that represent "real" numbers. All of the foregoing classes are experimental and are not supported by Symantec, but are provided as extra "goodies" for you to use.

There are many more goodies than I have space to mention. You'll just have to scour the CD to see the wealth of programs and data that the release has to offer.

THIRD-PARTY GOODIES

The release also contains a wealth of third-party shareware and demo applications. There are offerings from Bare Bones Software (a demo of the BBEdit v3.5 editor), NeoLogic (full source and demos for the neoAccess cross-platform object-oriented database engine), demo versions of a variety of utilities, including Resorcerer, Script Debugger, Developer VISE, VOODOO, CMaster v2.0.3, Tools Plus v2.1.6, and many others. There are also free versions of ProFont (a font created especially for displaying and printing code) and ShrinkWrap (an application that lets you mount disk images on your desktop, instead of having to install system versions or other software from floppy disks).

THE BOTTOM LINE

The Symantec C++ for Power Macintosh product retails for $399. Those of us who received this product after having purchased Symantec C++ v8.0 will see that renewal of the subscription for the next three issues will cost $149.95. CodeWarrior users can also trade up to this product for only $149.95, which is $50 less than renewing their CodeWarrior subscription.

There's very little not to like about the product. I like the smaller footprint and the increased efficiency of this release. I also like the ability to develop Java applets within the integrated environment. The built-in editor, compilation, and viewing features are quite efficient. I think you'll like this product too.

WEBTECH™

By Mathieu Lafourcade and Gilles Sérasset

CGIs in Lisp

A Web dictionary server

INTRODUCTION

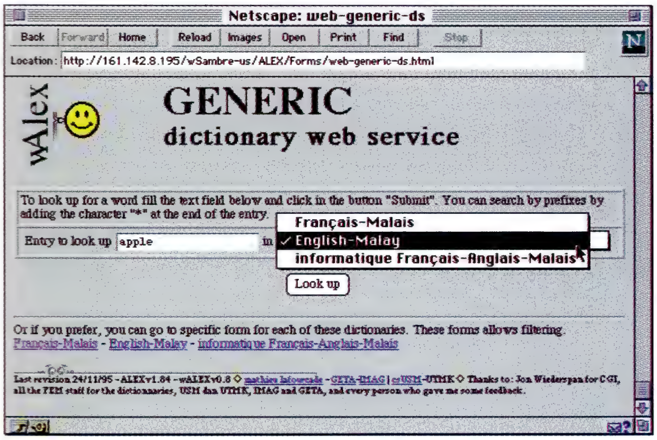
A paper dictionary is fine for reading comfort, versatility, etc., but updating of the data is not possible (apart from buying a new dictionary!), and the amount of data may be smaller than an electronic version. A resident electronic dictionary allows cut and paste, and updates are generally possible; but, like the paper dictionary, you must carry it along (in your hard disk). The Web-based dictionary doesn't take any space on your hard disk; the memory footprint is that of your Web browser. On the other hand you do rely on the availability of the network and/or server.

This article describes how a Web server offering multilingual dictionary services was set up by integrating three components: MacHTTP, AppleScript, and Macintosh Common Lisp (MCL). The dictionary server is constructed from a dictionary application, ALEX, written with MCL. This application can be remotely (and facelessly if needed) controlled with AppleScript. Given this design, the connection with MacHTTP is painless. The result is a very cost-effective way of providing a large linguistic resource on the Web.

Our developmental approach was to come up with something functional as fast as possible and to enhance the solution afterward. We had to compromise between functionality delivered to the user, performance, and the technical implications for the developer.

We first describe a typical user session; you can try this out yourself by pointing to the URL from your own browser (you can see the URL in Figure 1). The general architecture of the server is then presented, followed by some technical details about the three components.

Note: The included sources have often been trimmed to keep this article as short as possible – for instance, the error handling is generally not included.



Netscape: web-generic-ds

Location: http://161.142.8.195/wSambre-us/ALEX/Forms/web-generic-ds.html

GENERIC
dictionary web service

To look up for a word fill the text field below and click in the button "Submit". You can search by prefixes by adding the character "*" at the end of the entry.

Entry to look up apple in

Français-Malais
✓ English-Malay
informatique Français-Anglais-Malais

Or if you prefer, you can go to specific form for each of these dictionaries. These forms allows filtering.
Français-Malais - English-Malay - informatique Français-Anglais-Malais

Last revision 24/11/95 - ALEXv1.84 - wALEXv0.8 ◇ mathieu lafourcade - GETA-IMAG | cs USM-UTMK ◇ Thanks to: Jon Wiederspan for CGI, all the FEM staff for the dictionnaries, USM dan UTMK, IMAG and GETA, and every person who gave me some feedback.

Figure 1. Initial Web page of the server

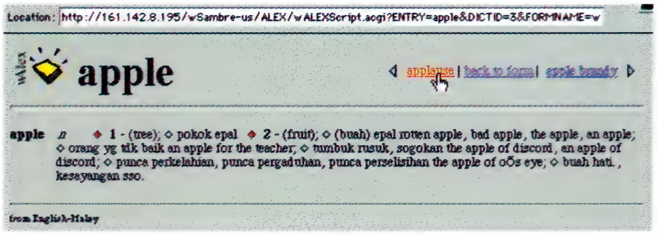
Mathieu Lafourcade works for the Study Group for Machine Translation (GETA) in Grenoble, France, but is currently enjoying several months in Malaysia under cover of a French-English-Malay dictionary development project at UTMK-USM (University of Sciences, Malaysia) at Penang. Besides expecting a baby in the coming months, he is working on software engineering for lingware. You can reach him at Mathieu.Lafourcade@imag.fr or lafourca@cs.usm.my.

Gilles Sérasset, who also works for GETA, is stuck in the cold weather of the Alps, and looking for any opportunity to go sunbathing on the Batu Ferringhi beaches of Penang. You can reach him at Gilles.Serasset@imag.fr.

A Typical User Session

The Web page displays a form (Figure 1). The user can choose a dictionary, enter a word to look up, and click on the "Look up" button. It is possible to terminate the candidate word with an asterisk; in this case the first entry which starts with the text entered is returned.

A new page appears displaying the information associated with the word entered (Figure 2). If the entry is not found, a (friendly) error message is given. Beside the title (corresponding to the word looked up), the user has access to links to the previous word (if any), to the form (just like pressing the "Back" button of the Web client), or to the next word (if any). This way, the user can walk through the entire dictionary.

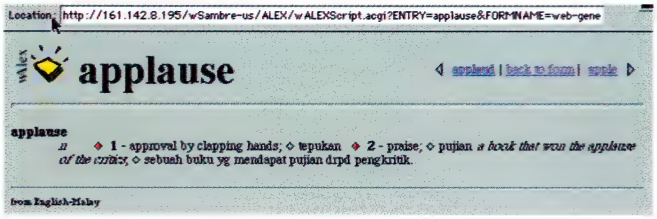

Location: http://161.142.8.195/wSambre-us/ALEX/wALEXScript.acgi?ENTRY=apple&DICTID=3&FORMNAME=w

apple *n* ◆ **1** - (tree); ◇ pokok epal ◆ **2** - (fruit); ◇ (buah) epal rotten apple, bad apple, the apple, an apple; ◇ orang yg tdk baik an apple for the teacher; ◇ tumbuk rusuk, sogokan the apple of discord, an apple of discord; ◇ punca perkelahian, punca pergaduhan, punca perselisihan the apple of oÕs eye; ◇ buah hati, kesayangan sso.

from English-Malay

Figure 2. The data displayed for the entry "apple"; the source of this page is given in Listing 10

For example, the user can click on the previous entry "applause" and obtain the corresponding page (Figure 3). The user can continue to scan the dictionary or can return to the form and choose an other entry or dictionary.


Location: http://161.142.8.195/wSambre-us/ALEX/wALEXScript.acgi?ENTRY=applause&FORMNAME=web-gene

applause
n ◆ **1** - approval by clapping hands; ◇ tepukan ◆ **2** - praise; ◇ pujian *a book that won the applause of the critics*, ◇ sebuah buku yg mendapat pujian drpd pengkritik.

from English-Malay

Figure 3. The web page for the entry "applause"

The HTML Form

The form used as an interface between user and server, the starting point of a session, is a plain HTML page. The link between this page and the application handling the action is made in the form declaration. The standard `POST` method is used for sending the message from the server to the application, wAlex.acgi.

We assume you are familiar with HTML (if not, check out the numerous informative pages available on the Web). The `<FORM>` tag specifies a form, which may include various items, such as text input (text field) and select input (menu). Notice that many less common characters (in English at least) are represented a specific way (for example the "ç" as `"&ccedil"`), and this is the beginning of big problems when you decide to deal with other languages, like French for instance.

Listing 1:
HTML Source of Figure 1

The dictionary lookup form

All the cosmetic and informative stuff at the beginning of the page.

```
<TITLE>web-generic-ds</TITLE>
<TABLE CELLPADDING=3 WIDTH="100%">
<TR>
  <TD ALIGN=LEFT>
  <img ALIGN=middle src="http://161.142.8.195/wSambre-
us/ALEX/Gifs/wAlex-vert.GIF" WIDTH=25>
  <img ALIGN=middle src="http://161.142.8.195/wSambre-
us/ALEX/Gifs/wAlexVLogo.GIF">
  </TD>
  <TD ALIGN=LEFT>
<H1><FONT SIZE=+7>GENERIC</FONT><BR> dictionary web
service</H1>
 </TD>
</TR>
</TABLE>
```

The form definition starts here.

```
<FORM ACTION="http://161.142.8.195/wSambre-
us/ALEX/wAlex.acgi" METHOD=Post>

<TABLE border UNITS=PIXELS CELLPADDING=2 WIDTH="100%">
<TR>
  <TD>
  <P>To look up for a word fill the text field below and
click in the button "Submit".
You can search by prefixes by adding the character "*" at the
end of the entry.<BR>
  </TD></TR>
<TR>
  <TD ALIGN=CENTER>Entry to look up <INPUT TYPE="text"
NAME="Entry" VALUE="" MAXLENGTH=150>
in
<SELECT NAME="DictID">
<OPTION VALUE="2">Fran&ccedil;ais-Malais
<OPTION VALUE="3">English-Malay
<OPTION VALUE="1">informatique Fran&ccedil;ais-Anglais-Malais
</SELECT>
  </TD></TR>
</TABLE>
```

The Submit button is defined here.

```
<P><CENTER><INPUT TYPE="Submit" VALUE="Look up"></CENTER>
```

One hidden item giving the name of the form we are in.

```
<INPUT TYPE=HIDDEN NAME="FormName" VALUE="web-generic-
ds.html">
```

The form definition ends here.

```
</FORM>
```

Some links to specific dictionary forms are presented here.

```
<HR>
Or if you prefer, you can go to specific form for each of
these dictionaries.
These forms allows filtering. <BR>
<A HREF="http://161.142.8.195/wSambre-us/ALEX/Forms/web-FEM-
ds.html">Fran&ccedil;ais-Malais</A> -
<A HREF="http://161.142.8.195/wSambre-us/ALEX/Forms/web-EM-
ds.html">English-Malay</A> -
<A HREF="http://161.142.8.195/wSambre-us/ALEX/Forms/web-
FEMterm-ds.html">informatique Fran&ccedil;ais-Anglais-
Malais</A>
```

The signature ends the page.

```
<P><IMG ALIGN = MIDDLE src="http://161.142.8.195/wSambre-
us/GIFgeneral/line.GIF"></br>
<FONT SIZE = 1> Last revision 24/11/95 - ALEXv1.84 -
wALEXv0.8  <IMG SRC="http://161.142.8.195/wSambre-
us/ALEX/Gifs/yellow-diamond.GIF">
<A HREF="http://161.142.8.195/wSambre-us/STAFF/ML-
```

```
us.html">mathieu lafourcade</A> -
<A HREF="http://imag.fr/IMAG/GETA.html">GETA</A>-<A
HREF="http://imag.fr/">IMAG</A> |
<A HREF="http://www.cs.usm.my/">csUSM</A>-<A>UTMK</A> <IMG
SRC="http://161.142.8.195/wSambre-us/ALEX/Gifs/yellow-
diamond.GIF">
 Thanks to: Jon Wiederspan for CGI, all the FEM staff
for the dictionaries, USM dan UTMK, IMAG and GETA, and every
person who gave me some feedback.
</FONT><P>
```

Opening Pandora's Box

How does the information get from the browser to the server to the Dictionary Service? In form-based queries, there are two methods (`POST` and `GET`) for submitting the data to the gateway script. We use only `POST`, as recommended by NCSA. `POST` (unlike `GET`) is not limited in the amount of information you can pass with a form.

A gateway script is needed on the server side to decode these arguments, process the query, and return an answer. In our case we have MacHTTP (the server application) and our MCL-based application, ALEX (which serves dictionary data). We have tested two different architectures for connecting MacHTTP to ALEX.

In the first solution, we transformed ALEX, our MCL appplication, itself into an acgi script. The second solution uses a small AppleScript applet to make the glue between MacHTTP and ALEX. Both methods have their own advantages and drawbacks.

ALEX (MCL) As a CGI Application

In the first solution MacHTTP interacts directly with ALEX, our MCL application (Figure 4). To make MacHTTP believe it is an acgi script, the name of the application must end with "`.acgi`". When MacHTTP receives a query from a WWW client requesting a file whose suffix mapping is "`.acgi`" (an executable application), MacHTTP will attempt to communicate with it via a custom Apple event of class `'WWWΩ'` and ID `'sdoc'`. We want the received request to be handled by ALEX; hence, our application has to listen (at least) to this particular Apple event. For this solution, we also have to change the name of the form action in the HTML file to `wAlex.acgi` (which is the name of our MCL application).

MCL directly supports the four required Apple events sent by the Finder: Open Application, Open Documents, Print Documents, and Quit Application. In addition, MCL provides a very easy way to support other Apple events by writing and installing new Apple event handlers.

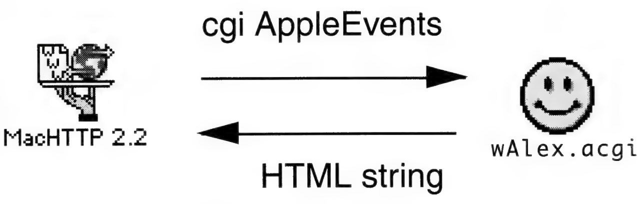


Figure 4. MacHTTP communicates directly with ALEX transformed into an ACGI application

Handling Apple events

An Apple event handler is a generic function specialized on the `application` class. Hence it is possible to customize the behaviour of the predefined Apple event handlers by specializing the `application` class. This is not necessary for our purpose. However, we have to write a new handler for the CGI event.

As MCL bypasses the Apple Event Manager's dispatch routine, you don't have to bother with how your function is called by the Apple Event Manager. Lisp takes care of dispatching and run-time error checking. If no error occurs, your handler should simply return in a normal way. The returned value is ignored. If an error occurs, your handler should signal an `appleevent-error` condition, with an error number and an optional error string.

An Apple event handler has four arguments: the *application* (always the value of the global variable `*application*`), the *Apple event* (you generally don't have to look at the record structure directly), the *reply* (another Apple event record, provided by the Apple Event Manager) and an optional handler *reference constant* (any Lisp object that can be used e.g. to distinguish two different installations of the same handler; this will be ignored for our purpose). Look at Listing 4.

Decoding arguments

MacHTTP provides a lot of information (client address, user name and password, arguments of the request, etc.). MacHTTP's documentation will give you the complete set of parameters and their four-byte codes.

To get the value associated with each parameter, you have to use the `ae-get-parameter-char` function. You specify the AppleEvent object and the parameter, and the function returns a string containing the required value.

In our case, we assume that the client issues a `POST` method (the `GET` method case can be easily deduced from this code). Hence, the arguments we need are the post arguments, accessible via the `'post'` four-byte code.

The `ae-get-parameter-char` function returns a string consisting of all the variables of the form, and their values appended together. This format is not directly usable; hence, we will transform it into a list of variable-value pairs. For instance, the argument string:

```
"ENTRY=apple&FORMNAME=web-generic-ds&DICTID=3"
```

will be transformed into:

```
(:DICTID "3"
 :FORMNAME "web-generic-ds"
 :ENTRY "apple")
```

To transform this kind of string, we use one of our publicly available packages called `geta-strings` (ftp://ftp.digitool.com//pub/MCL/contrib/geta-strings-1.3.sea.hqx).

Listing 2:
wAlex.acgi 1/3 (MCL Application)

Decoding POST arguments

```
(defun create-keywords-from-args (args)
;; segment the string with '&' as a separator
 (let ((mylist (geta-strings::list-words args "&"))
       pair
       result)
;; for each part, segment with '=' as a separator and construct the result
  (dolist (lv-pair mylist)
    (setf pair (geta-strings::list-words lv-pair "="))
    (push (second pair) result)
    (push
     (read-from-string
      (concatenate 'string ":" (first pair))) result)
      )
    result))
```

This list will be simply used as a list of arguments for a function accepting all the variables defined in the HTML form as keys. Hence, we rely on the standard Lisp binding mechanism to bind each value to its variable. For our purpose, we ask the appropriate dictionary for an HTML version of the entry structure.

Listing 3:
wAlex.acgi 2/3 (MCL Application)

Getting the corresponding entry

```
(defun get-walex-entry  (&key dictid
                          dicttype
                          formname
                          entry
                          &allow-other-keys)
;; Now, we can directly use each variable to query our dictionary
  (let ((dict (get-dictionary dictid dicttype)))
    (findAndTransmuteItem
      dict
      entry :output-format :html-1))
  )
```

Replying

MacHTTP expects the Apple event reply's direct parameter to contain an HTTP/1.0 header and HTML text that will be transmitted to the client. Hence, we have to construct an appropriate answer. The HTML/1.0 header will be built as a global variable:

```
;; Define the http 1.0 header (beware of crlf)
(defvar *crlf*
  (format nil "~A~A" #\Linefeed #\Newline))
(defvar *http-10-header*
  (format nil "HTTP/1.0 200 OK ~A~
               Server: MacHTTP ~A~
               MIME-Version: 1.0 ~A~
               Content-type: text/html ~A~A"
          *crlf* *crlf* *crlf* *crlf* *crlf*))
```

The reply itself will be returned by the `findAndTransmuteItem` function. Hence, we just have to put the header and answer in the Apple event reply's direct parameter with the `ae-put-parameter-char` function.

Listing 4:
wAlex.acgi 3/3 (MCL Application)

Defining and installing the Apple event handler

```
(defmethod my-ae-handler ((a application)
                          theAppleEvent
                          reply
                          handlerRefcon)
;; We don't use the handlerRefcon argument
  (declare (ignore handlerRefcon))
;; Just get the post parameter, decode it, handle it and reply
  (let* ((post-args
           (create-keywords-from-args
             (ae-get-parameter-char theAppleEvent
                                    :|post| t)))
         (the-answer
          (apply #'get-walex-entry post-args)))
;; Build the reply and put it into the Apple event reply's direct parameter
    (ae-put-parameter-char reply #$keyDirectObject
                           (format nil "~A ~A"
                                   *http-10-header*
                                   the-answer))
))
(install-appleevent-handler :|WWWΩ| :|sdoc| #'my-ae-handler)
```

AN APPLESCRIPT APPLET AS GLUE

In this second solution (Figure 5) we use an AppleScript applet to make the glue between MacHTTP and ALEX (MCL). As in the previous solution, the applet is named wAlex.acgi. It is now up to the applet to decode the argument passed by MacHTTP. This time the decoding is done thanks to several Scripting Extensions.

The Tokenize function allows you to transform a string with separating characters into a list. For example, from `"A;list;of;word"` you will get `{"A" "list" "of" "words"}` if you take ; as the separator. DePlus does the same, but with the + character (more specific and more efficient). Encoding a URL consists of replacing any problematic characters with their `%xx` counterpart (for example, the space is replaced by `%20`). Decoding a URL is the reverse process. DecodeURL_8bits does more by also handling the nightmarish problem of accents (and diacritics in general).

After being activated by MacHTTP, the wAlex.acgi applet calls specific AppleScript Programming Interface (ASPI) procedures of the dictionary server application ALEX (MCL).

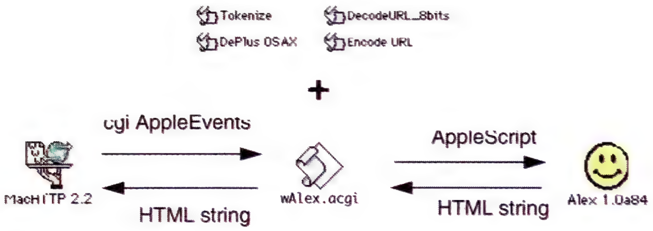


Figure 5. MacHTTP communicates indirectly with ALEX through an AppleScript applet

The communication between MacHTTP and wAlex.acgi is asynchronous. This means that MacHTTP is not waiting for the script to reply. But the communication is synchronous between wAlexScript and ALEX. As we didn't deal with time-out in our script, the default value of 60 seconds applies. ALEX has to reply within one minute (no user will stand a much longer delay anyway).

This solution is well adapted to our needs, as we would like to add more dictionaries that are not necessarily managed by our MCL application. With this solution, we need very little change to the AppleScript applet to integrate new tools.

The script

We use the `POST` method in our forms or in the links associated with the previous and next entries. In the entry point, the dispatching to the appropriate function is handled on the basis of the `method` argument.

Notice that for an AppleScript applet, when properties are set outside of the event handlers, they are "remembered" across launches. We want the script to be continuously open.

Listing 5: wAlex.acgi (AppleScript Applet)

Properties and CGI entry point

```
-- This code comes from Jon Wiederspan and has been modified to fit our purposes.
-- Some properties are defined for making it easier to read.
property crlf : (ASCII character 13) & (ASCII character 10)
property http_10_header : "HTTP/1.0 200 OK" & crlf & "Server:
MacHTTP" & crlf & "MIME-Version: 1.0" & crlf & "Content-type:
text/html" & crlf & crlf

property theApp : application "Alex"

-- The main entry of our script.
on «event WWWΩsdoc» path_args ¬
  given «class kfor»:http_search_args, «class
post»:post_args, «class meth»:method, «class
addr»:client_address, «class user»:username, «class
pass»:|password|, «class frmu»:from_user, «class
svnm»:server_name, «class svpt»:server_port, «class
scnm»:script_name, «class ctyp»:content_type

-- Decode the Post arguments.
  try
    – Tokenizing our arguments means creating a list (or arguments) form a string
    set tokenized_pa to tokenize post_args with delimiters
{"&"}

-- Save the original AppleScript text item delimiters.
    set oldDelim to AppleScript's text item delimiters

-- Use "=" to delimit the pairs.
    set AppleScript's text item delimiters to {"="}

-- Retrieve our arguments (it is positional and thus not very nice).
    set theEntry to (Decode URL
      (dePlus (last text item of item 1 of tokenized_pa)))
    set theBaseID to (Decode URL
      (dePlus (last text item of item 3 of tokenized_pa)))

-- Restore the original AppleScript text item delimiters.
    set AppleScript's text item delimiters to oldDelim

-- Returns the result (we don't use theFrom for simplicity)
    return http_10_header &
      getAlexEntryWithID(theBaseID, theEntry, post_args)

-- Error handling (not detailed).
  on error msg number num
    ...
  end try
end «event WWWΩsdoc»
```

For our purpose we consider only two arguments (although some others could be useful later on): the word to look up, and a reference to the dictionary. The entry is strictly the string given by the user. The base ID is strictly the selected option of the selected item (in the list of available dictionaries). You can see that in fact we pass the whole argument string along with the two decoded argument. We use this technique for handling optional arguments. In this case the string should be decoded by ALEX (exactly the same way it is done in our first solution). The value of `post_args` giving rise to Figure 2 is `"ENTRY=apple&DictID=3"`. You can see from Figure 1 what settings in the form this refers to.

AND THE WINNER IS...

The main advantage of the first solution is that the direct interaction between MacHTTP and MCL doesn't make use of AppleScript. The integration is lighter, and thus there is better overall performance in speed and robustness. But you have to delve into the decoding of AppleEvents.

The second solution is technically simpler, and you can very easily change the Lisp interface without changing the overall processing. You can also use other applications to manage dictionaries accessible by the same form. The choice of the target application is done by the applet.

For our actual implementation we retained the second solution, but the choice depends on the goals you assign to your application.

One last question can arise: where we should decode the arguments. We have presented two radically different ways of decoding, with either MCL or the AppleScript applet doing the job. Actually, in the current version of our server, we used a mixture of the two approaches. The AppleScript is used, but decodes only certain arguments (the dictionary name), and always passes the whole argument string to MCL. Then, MCL itself decodes the string with the help of the code presented in listings 2 and 3.

ALEX

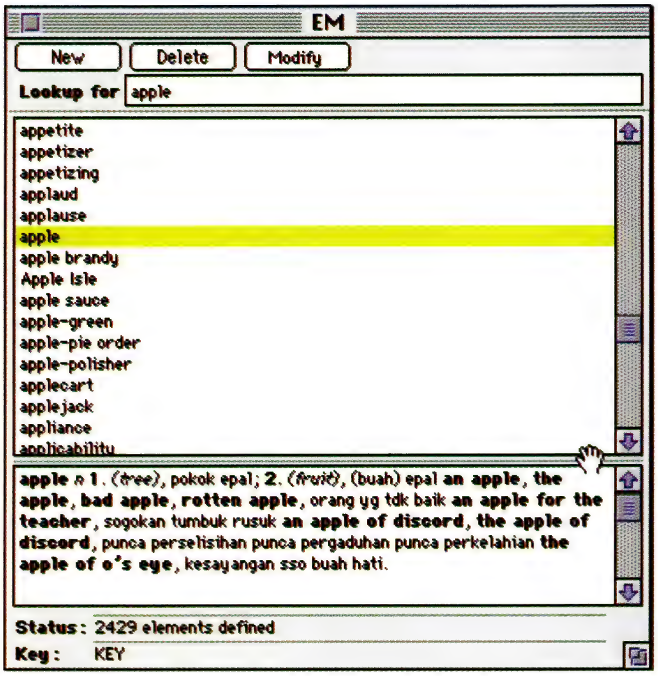
ALEX, the application that serves dictionary information, has been developed with MCL. This tool can be used as an end-user tool with a user interface, or can be remotely and facelessly controlled with AppleScript.

Overview: a small session

ALEX is a small tool allowing a user to open and browse dictionaries. The interface, although minimal, seems quite efficient for the assigned purpose. This tool has been developed as a part of research on the kind of interface needed (or desirable) for structured dictionaries.

The user can scroll through the entry list (not implemented with the list manager, which is limited to around 4000 items), or can make simple active lookups. By active lookup we mean that as the user enters characters into the text box at the top of the window the first entry starting with those characters is selected.

What makes ALEX somewhat different from other tools is that all the entries are kept structured and displayed on the fly, allowing the user to specify some filtering process. It is possible to ask for several kinds of formatting. Another aspect, still under investigation, is the complete scriptability of ALEX.



Lookup for apple

appetite
appetizer
appetizing
applaud
applause
apple
apple brandy
Apple Isle
apple sauce
apple-green
apple-pie order
apple-polisher
applecart
applejack
appliance
applicability

apple *n* 1. *(tree)*, pokok epal; **2.** *(fruit)*, (buah) epal **an apple, the apple, bad apple, rotten apple**, orang yg tdk baik **an apple for the teacher**, sogokan tumbuk rusuk **an apple of discord, the apple of discord**, punca perselisihan punca pergaduhan punca perkelahian **the apple of o's eye**, kesayangan sso buah hati.

Status: 2429 elements defined
Key: KEY

Figure 6. An ALEX window displaying the entry "apple" of the English-Malay dictionary

Architecture

The implementation of ALEX is based on several layers, all implemented with MCL. MCL relies on a Dictionary Object Protocol. This manager allows the developer to define multi-key dictionaries and manipulate them. The DOP itself is based on Wood, a persistent Object-Oriented Database developed by Bill St. Clair (ftp://ftp.digitool.com/pub/mcl/contrib/wood/). The persistency allows a minimal memory footprint – a dictionary is never completly loaded into memory. ALEX can be considered as a reduced user interface for the DOP, allowing remote control by AppleScript.

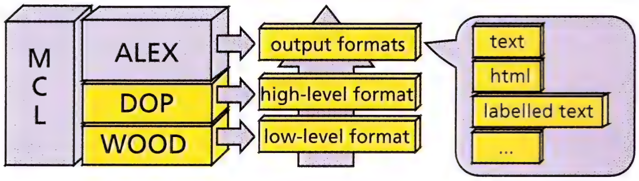


Figure 7. Layers of the actual implementation of ALEX. The Wood layer stores the low-level format of the dictionary entry. The DOP dynamically decodes each entry in a high-level format. From this high-level format, ALEX produces any output format.

AppleScript Programming Interface (ASPI)

The `do script` AppleScript command is a universal command for controlling ALEX. This is very practical for debugging and trying new ideas; you just have to throw Lisp code at ALEX through AppleScript. The dark side is that anyone can do anything. In order for this to work, don't forget to load the `eval-server.lisp` file located in the MCL Examples folder with a `(require :eval-server)` form.

We defined some AppleScript commands that can do specific actions: opening and closing a dictionary, looking up, inserting and deleting entries, etc. The two transmute functions are the ones used in the HTML code.

Listing 6:
ASPI

getAlexEntryWithID

```
-- Get the data in the HTML format with the id of the base.
on getAlexEntryWithID(id, entry, args)
  tell TheApp
    do script ("(get-alex-item (alex::base
      (alex::get-dict-handler \"" & id &
      "\"  :id)) " & "\"" & entry & "\"" &
      " :output-format :html-1 & :args & "\"" args & "\")")
  end tell
end getAlexEntryWithID
```

As you can see, scripting our MCL application consists simply of building strings that, once given to the Lisp interpreter, will produce some effect. Yes, you can do Lisp from AppleScript! This is simple and neat. Of course, you cannot ask an end-user to write some Lisp code from AppleScript; this is why you have to provide what we call an AppleScript Programming Interface (ASPI). It is a set of AppleScript commands that will control your application. The `getAlexEntryWithID` function is one of the functions of ALEX's ASPI.

Many of the functions come in two flavors, with dictionary access by ID or by name. For example, `getAlexEntryWithID` has its `getAlexEntryWithName` counterpart. Some of them are documented in Listing 7.

Listing 7:
Other ASPI Useful for ALEX

openAlexDictionary

```
-- Open a base from a given filename. Return an index dictionary or 0 in case of error.
on openAlexDictionary(filename)
  tell theApp
    return do script ¬
      ("(alex::open-object :alex-base :return-index t :file
        (pathname \"" & filename & "\"))")
  end tell
end openAlexDictionary
```

getAlexDictionaryName

```
-- Return the dictionary name based on the dictionary id.
on getAlexDictionaryName(id)
  tell theApp
    return do script ("(alex:name (alex::base
      (alex::get-dict-handler \"" & id & "\"  :id)))")
  end tell
end getAlexDictionaryName
```

deleteAlexEntryWithID

-- Deletes an entry (if defined) based on the dictionary id.

```
on deleteAlexEntryWithID(id, entry)
  tell theApp
    do script ("(delete-item (alex::base
      (alex::get-dict-handler \"" & id & "\"  :id)) :key "
      & "\"" & entry & "\"" & ")")
  end tell
end deleteAlexEntryWithID
```

Take some time to document your ASPI, and you have achieved the same result as developing your AppleEvents suite, but with less effort and time. One main difference from the more classical method is that your application has no AppleScript dictionary and you cannot use clauses.

Dictionary data structure

The entries are kept in a specific format in the dictionary. This format has been designed to compromise between file space and decoding time. For our dictionary a DOP base is linked to a text file which stands for a text buffer. The low-level format is basically a vector of index-length pairs pointing to this buffer. When an item is found, it is dynamically decoded into a high-level format (example in Listing 10).

The `get-alex-item` function of ALEX (called by `getEntryWithID`) basically retrieves one dictionary item and calls `transmute-entry`, which transforms the high-level format into any output format specifed by the developer. We take advantage of the generic function mechanism of CLOS (Common Lisp Object System) in MCL to have an easily extensible collection of specific formats. The selection of the appropriate method is done on the basis of specialised arguments of the function, basically the type of the current item and the desired output format (cf. Listing 9).

Listing 8: Two CLOS Headers for Plain Text and HTML Formatting

transmute-entry

First method for of text output (code not detailed).

```
(defmethod transmute-entry (entry
                   (entry-type (eql :en-entry))
                   (output-format (eql :text)) )
  ...)
```

Second method for one kind of HTML output (code not detailed).

```
(defmethod transmute-entry (entry
                   (entry-type (eql :en-entry))
                   (output-format (eql :html-1)) )
  ...)
```

Listing 9: High-level Format of ALEX Items

High-level format for "apple"

The high level format of ALEX is a (kind of) property list. The first item is always the type of the entry. The rest of the structure is made of an open list composed of a type and one or several string values.

```
(:EM-ENTRY (:ENTRY "apple") (:C "n") (:N "1") (:G "(tree)")
(:ME "pokok epal") (:N "2") (:G "(fruit)") (:ME "(buah)
epal") (:P "an apple") (:P "the apple") (:P "bad apple") (:P
"rotten apple") (:MPE "orang yg tdk baik") (:P "an apple for
the teacher") (:MPE "sogokan") (:MPE "tumbuk rusuk") (:P "an
apple of discord") (:P "the apple of discord") (:MPE "punca
perselisihan") (:MPE "punca pergaduhan") (:MPE "punca
perkelahian") (:P "the apple of o's eye") (:MPE "kesayangan
sso") (:MPE "buah hati."))
```

Requested output format

The code produced by ALEX for the entry "apple" is given in listing 10 (the code has been slightly edited for readability). Besides the cosmetic features of the page, the most interesting part of the listing is the handling of the "previous" and "next" entries.

Listing 10: Source of Figure 2

HTML "apple"

Beginning of the header of the page and control part for access to the previous and next entries.

```
<TABLE CELLPADDING=0 WIDTH="100%"><TD><IMG
SRC="http://161.142.8.195/wSambre-us/ALEX/Gifs/walex-
vert.GIF" width=10> <IMG ALIGN=Bottom
SRC="http://161.142.8.195/wSambre-
us/ALEX/Gifs/stack.GIF"><b><FONT SIZE = +6> apple </FONT></B>
<TD ALIGN=Right><TABLE border=0>
```

The left arrow and the previous word. Here (and only here) the GET method is used in the urls (notice the ? character).

```
<TD VALIGN=CENTER>
<A HREF="http://161.142.8.195/wSambre-
us/ALEX/wALEXScript.acgi?ENTRY=applause&FORMNAME=web-generic-
ds.html&DICTID=3"><IMG SRC="http://161.142.8.195/wSambre-
us/ALEX/Gifs/left-arrow.GIF" BORDER=0></A></TD>
<TD VALIGN=CENTER><A HREF="http://161.142.8.195/wSambre-
us/ALEX/wALEXScript.acgi?ENTRY=applause&FORMNAME=web-generic-
ds.html&DICTID=3"> applause</A>
</TD>
```

The link back to the form.

```
<TD VALIGN=CENTER> | <A HREF="http://161.142.8.195/wSambre-
us/ALEX/Forms/web-generic-ds.html">back to form</A> | </TD>
```

The right arrow and the next word.

```
<TD VALIGN=CENTER><A HREF="http://161.142.8.195/wSambre-
us/ALEX/wALEXScript.acgi?ENTRY=apple+brandy&FORMNAME=web-
generic-ds.html&DICTID=3">apple brandy</A></TD>
<TD VALIGN=CENTER><A HREF="http://161.142.8.195/wSambre-
us/ALEX/wALEXScript.acgi?ENTRY=apple+brandy&FORMNAME=web-
generic-ds.html&DICTID=3"><IMG
SRC="http://161.142.8.195/wSambre-us/ALEX/Gifs/right-
arrow.GIF" BORDER=0></A></TD></TABLE></TABLE>
```

The informative part of this page.

```
<HR SIZE=4><DL COMPACT>
<DT><B>apple</B>
<DD><I>n</I><IMG HSPACE=8 SRC="http://161.142.8.195/wSambre-
us/ALEX/Gifs/space.GIF"> <IMG HSPACE=6
SRC="http://161.142.8.195/wSambre-us/ALEX/Gifs/red-
diamond.GIF">
<B>1</B> -  (tree); <IMG SRC="http://161.142.8.195/wSambre-
us/ALEX/Gifs/cyan-diamond.GIF"> pokok epal <IMG HSPACE=6
SRC="http://161.142.8.195/wSambre-us/ALEX/Gifs/red-
diamond.GIF">
<B>2</B> - (fruit); <IMG SRC="http://161.142.8.195/wSambre-
us/ALEX/Gifs/cyan-diamond.GIF"> (buah) epal  rotten apple,
bad apple, the apple, an apple; <IMG
SRC="http://161.142.8.195/wSambre-us/ALEX/Gifs/cyan-
diamond.GIF"> orang yg tdk baik  an apple for the teacher;
<IMG SRC="http://161.142.8.195/wSambre-us/ALEX/Gifs/cyan-
diamond.GIF"> tumbuk rusuk, sogokan  the apple of discord, an
apple of discord; <IMG SRC="http://161.142.8.195/wSambre-
us/ALEX/Gifs/cyan-diamond.GIF"> punca perkelahian, punca
pergaduhan, punca perselisihan  the apple of o's eye; <IMG
SRC="http://161.142.8.195/wSambre-us/ALEX/Gifs/cyan-
diamond.GIF"> buah hati., kesayangan sso.</DL>
```

Information to remind the user in which dictionary he is looking.

```
<HR><FONT SIZE=1>from English-Malay</FONT>
```

Note that the space character in "apple Brandy" has been replaced by a `'+'`. This has been done at the HTML page

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production level. Leaving the space would have led to strange and unpleasant results.

By the way, there is a bug (or, say, a slight but unpleasant defect) in this HTML page; can you figure it out? Looking attentively at Figure 2 might help.

ALTERNATIVE SOLUTIONS, SHORTCOMINGS AND FUTURE WORKS

There are many unsatisfactory details in the solution we present here, either for the user experience or the developer's technical investment. We are working to fix or bypass some, but many remain beyond our reach, as we do not control the technology.

Filtering

Alternative forms (accessible from the page of Figure 1) allow some filtering on a French-English-Malay dictionary. As the kind of filtering is dependent on the selected dictionary, it was impossible to provide a single interface giving simultaneously the dictionary choice and the filtering options.

Diacritics

A common problem is encountered with diacritics. To properly produce HTML pages, it is compulsory to process each string of the dictionary item and to replace dubious characters by HTML codes. The little bug of Listing 10 is contained in "the apple of o's eye". The closing single smart quote character is not a valid one in HTML, resulting in poor formatting in Figure 2.

Speech

We are considering giving speech output to some information associated with an entry of our dictionary. On the Web server, a Text-To-Speech system could be installed and produce sound files to be downloaded by the client. But that's another story.

CONCLUSION

Technology integration is difficult for many reasons: you have to be reasonably knowledgeable in the different technologies you deal with, you have to compromise between many factors, and the whole thing is often hairy to debug.

As stated by Apple, AppleScript is the way to integrate technologies on Mac OS; but lots of people find it difficult to develop AppleScript-aware applications. With Macintosh Common Lisp, AppleScript awareness is given for free (the `do script` command). You can come up with a functional result quickly, satisfy your customers, and have a great tool to experiment with ideas and automated tasks.

ACKNOWLEDGMENTS

We would like to thank all the people who participated in the development of the tools mentioned in this paper: Apple and Digitool, of course, but also Jon Wiederspan for his CGI-aware script samples. Thank you, Bill, for the tremendous support to MCL and Wood. We would also not wish to forget all the people involved in our French-English-Malay Dictionary, the staff of the UTMK laboratory in Penang, the French Embassy in Malaysia, the DBDP in Kuala Lumpur, and the GETA in Grenoble, France.

[If you're curious about the authors and their work (and surroundings), start with the following Web pages, which I uncovered by guesswork (no word-searching necessary). You may need to brush up on your French first! – man]

http://clips.imag.fr/
http://www.imag.fr/IMAG/IMAG.html
http://www-clips.imag.fr/geta/
http://www-clips.imag.fr/geta/gilles.serasset/
http://www.usm.my/
http://161.142.8.195/wSambre-us/sambre-welcome-us.html
http://161.142.8.195/wSambre-us/Staff/ML-us.html

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SYMANTEC TOP 10

By Craig Conner

This monthly column, written by Symantec's Technical Support Engineers, is intended to give our readers technical information on using Symantec products.

This month we take a look at some new technologies, and then look at SPM. We also visit a few interesting topics from the newsgroups.

Q: I would like to do development of QuickDraw 3D applications using SPM, but I am getting "unrecognized pragma" warnings after patching the QD3D headers and samples.

A: The latest versions of the QuickDraw 3D headers (from the April '96 SDK) do not need any changes; however, they do include a pragma option, `!align_arrays`, which is not supported (and not necessary) on a PPC machine. Since it is just a warning, you can safely ignore it.

Also, to compile and debug the sample projects, you will need to:

1. open and update the project files;
2. enable Exception Handling in the PowerPC translator;
3. enable Background Events; and
4. replace the `.xcoff` libraries with their non-`.xcoff` versions using the **Script** menu item **Replace .xcoff libs**.

Q: Now that SPM supports 68K, can I create 68K code resources?

A: Yes. You will need to specify the correct link options via the Link Options, and you will need to specify the resource type and ID in the Command Line Linker Options page in the Additional Command Line Options.edit pane with `-rt type=ID`. Also, the SPM adds a `'SIZE'` resource to your target, which can be removed with ResEdit. Contact Symantec Technical Support for a project model to ease set-up.

Q: Can I use SPM to build Apple Shared Library Manager libraries?

A: Yes. There is a project model for building shared libraries on our ftp site at ftp://ftp.symantec.com.

Q: I would like to be able to write 68K assembly code, but the 8.1 C translator does not allow that. Is there a way to use 68K assembly code in SPM?

A: Yes. In the `Goodies:Tech Support Goodies` folder are 68K Assembly and 68K Pascal translators. These two translators allow you to compile 68K code via ToolServer, but provide a consistent user interface within the Symantec Project Manager. These two translators also support the new ability of SPM to combine 68K and PPC source and libraries within the same project, to create a fat application using a single project file.

Q: I want to use MrC++ to build a VA application, but if I specify MrC and MrC++ as the translators, I get a bunch of undefined Bedrock symbols.

A: MrC and MrC++ do not currently support the native exception handling of the Symantec C and C++ translators, but by replacing `BRLib.o` and `PPCCPlusLib TCL.o` with `BrLib (non-native eh).o` and `PPCCPlusLib TCL_BRLibeh.o` [*I suspect he means* `PPCCPlusLib TCL_BELeh.o` *here – man*], you can use MrC and MrC++ to generate your VA application.

Q: I am getting this link error when building an application in the SPM:

```
"Toolserver 's must occur in pairs."
```

What causes it?

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A: Most likely, you have a single-quote character in a folder located in the path to your project folder, something like `Dave's Folder`. ToolServer makes special use of single-quote characters in pathnames. Removing the apostrophe will fix the problem but make your filenames sound ungrammatical. So much for good English.

Q: When trying to create a PCI driver, I get these link errors:

```
Multiply Defined Symbol:
   BlockMove (DriverServicesLib, InterfaceLib)
Multiply DefinedSymbol:
   BlockMoveData (DriverServicesLib, InterfaceLib)
```

The libraries involved are:

`DriverServicesLib 1.0.2` from the April 96 SDK 2 disk
`InterfaceLib 1.1` from our Release 5 CD

How do I avoid this?

A: This is a bug in the `DriverServicesLib`. These symbols should not have been redefined in this library. Hopefully, by the time you read this Apple will have released a newer version.

Q: And now a Java question. When compiling my Java project I am getting the compile error:

```
Error: File Foo.class does not contain Foo as expected,
but    java.somepackage.Foo.  Please remove the file.
```

What gives?

A: The project is looking for something in the `java.somepackage.Foo` package, but can not find it. Most likely you forgot to `import` it. Add an `import java.somepackage.Foo` line and it should fix it.

Q: Is there a TCL archive somewhere?

A: You can now find indices at:
http://rhino.harvard.edu/dan/TCLArchive.html
and the files themselves at:
ftp://rhino.harvard.edu/pub/dan/TCL/

If you have classes you want to add, upload them to:
ftp://rhino.harvard.edu/incoming/
and send Dan Crevier at dan@rhino.harvard.edu a message about it. By the way, thanks, Dan.

Q: I am trying to port a PowerPlant application to Symantec C++, but I get the following error:

```
File "PPobClasses.cp"; Line 57
Error:   cannot implicitly convert
from: LButton *(*"C++")(LStream *)
to  : void *(*"C++")(LStream *)
```

on the line:

```
URegistrar::RegisterClass(LButton::class_ID,
   LButton::CreateButtonStream);
```

Why?

A: The second parameter of `RegisterClass()` is a `ClassCreatorFunc`, defined as:

```
typedef void* (*ClassCreatorFunc)(LStream *);
```

The problem is that each object's creator function (as for `LButton` above) returns a pointer to a class, which violates contravariance rules of C++.

Thanks to multiple people here in tech support, who each individually probably wrote more for this article than I did.

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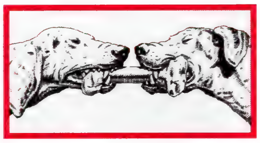
PROGRAMMER'S CHALLENGE



By Bob Boonstra

CONNECT IV

This month, your Challenge is to write code for a well-known game that will compete against other Challenge entries, as well as against the clock. The game board consists of an `N×M` array into which two players alternate inserting pieces. Pieces are inserted into the top of a column in the vertically oriented board, so that they drop into the lowest unoccupied cell of that column. The objective is to be the first player to arrange 4 or more pieces into a vertical, horizontal, or diagonal line.

The winner of this Challenge will be determined by a round-robin tournament in which each entry competes against each other entry an even number of times, half of the time playing with the first move, and half playing with the second move. (If the number of entries makes a full round-robin tournament impractical, I'll use another fair tournament scheme.) Each tournament victory will earn two points for the winning entry, and each tie earns one point. The entry with the greatest number of tournament points wins the Challenge. Ties will be broken by execution time, code size, etc.

The prototype for the code you should write is:

```
long /*yourMove*/ ConnectMove (
  long numCols,          /* number of columns in the game board */
  long numRows,          /* number of rows in the game board */
  void *privStorage,     /* preallocated storage for your use */
  long prevMove,     /* column where opponent last moved, 0 .. numCols-1 */
  Boolean newGame,       /* TRUE if this is your first move in a new game */
  Boolean *victory       /* set to TRUE if you claim victory */
                         /*  this move, otherwise set to FALSE */
);
```

For your first move in a new game, your `ConnectMove` code will be called with `newGame` set to `TRUE`. If your opponent made the first move in this game, `prevMove` will be set to the (origin zero) column that the opponent selected as the first move. If you are to make the first move, `prevMove` will be set to `-1`. In the call for the first move of a new game, you will also be provided with a pointer `privStorage` to 1MB of memory, already initialized to zero, for your use during that game. Finally, the initial call will provide the number of columns (`numCols`) and rows (`numRows`) in the board for that game. The number of rows and columns will each be larger than 6 and less than 64.

THE NEW DEADLINE

The Challenge is due on the FIRST of the month, not the tenth, as has been the case since the column started. To get the Challenge problem in time, you should be subscribed to the Programmer's Challenge Announcement List.

Subscribe by sending an email to "macjordomo@listmail.xplain.com", with the MESSAGE "sub challenge-a Your Name".

There's also an open discussion list to discuss Challenges, review solutions, and talk about efficient computing. You subscribe to this list by sending an email to "macjordomo@listmail.xplain.com", with the MESSAGE "sub challenge-d Your Name".

And finally, there's an ftp site for members of the Challenge lists. Its URL is: ftp://ftp.mactech.com/mactech/CHALLENGE.

People have used the ftp site to trade sample data and upload alternative solutions.

THE RULES

Here's how it works: Each month we present a new programming challenge. First, write some code that solves the challenge. Second, optimize your code (a lot). Then, submit your solution to *MacTech Magazine*. We choose a winner based on code correctness, speed, size, and elegance (in that order of importance) as well as the submission date. In the event of multiple equally desirable solutions, we'll choose one winner (with honorable mention, but no prize, given to the runner up). The prize for each month's best solution is a $100 credit for Developer Depot™ and a limited-edition "The Winner! MacTech Programmers Challenge" T-shirt (not available in stores anywhere).

Unless stated otherwise in the problem statement, the following rules apply: All solutions must be in ANSI compatible C. Use only pure C code. We disqualify entries with any assembly in them (except for challenges specifically stating otherwise). You may call any Macintosh Toolbox routine (e.g., it doesn't matter if you use NewPtr instead of malloc). We test entries with compiler options set to disable FPU use (for 680x0 code) and to enable all available speed optimizations. The compiler to be used and the target instruction set (680x0 or PowerPC) will be stated in the problem. **Limit your code to 60 characters per line;** this helps with e-mail gateways and page layout.

We publish the solution and winners for each month's Programmer's Challenge two months later. All submissions must be ***received by*** the 1st day of the month printed on the front cover of this issue.

You can get a head start on the Challenge by reading the Programmer's Challenge mailing list. It will be posted to the list on or before the 12th of the preceding month. To join, send an email to macjordomo@listmail.xplain.com with the message "sub challenge-A YourName'.

Mark solutions "Attn: Programmer's Challenge Solution" and send it by e-mail to one of the Programmer's Challenge addresses in the "How to Communicate With Us" section on page 2 of this issue. Include the solution, all related files, and your contact info.

MacTech Magazine reserves the right to publish any solution entered in the Programmer's Challenge. Authors grant *MacTech Magazine* the exclusive right to publish entries without limitation upon submission of each entry. Authors retain copyrights for the code.

Alternating calls will be made to your `ConnectMove` routine and the opposing `ConnectMove` routine. For the second and subsequent moves in each game, `newGame` will be set to `FALSE`, and the values of `numCols`, `numRows`, and `privStorage` will be the same as in the initial call. Each time `ConnectMove` is called, you should evaluate the move made by your opponent (provided in `prevMove`) and return the column into which you make your move as the function result. If you believe you have won the game, you should set `*victory` to `TRUE`; otherwise you should set `*victory` to `FALSE`. Falsely claiming victory or making an illegal move, such as trying to insert a game piece into a column that is already filled, will result in forfeiting that game.

For this Challenge, you may dynamically allocate additional storage beyond that provided by `privStorage`, provided you deallocate it before returning after each move. You may not use any static storage beyond that provided by `privStorage`.

To conduct the tournament, the code for multiple entries will be compiled into a single application. In case you are wondering, I will append a unique integer to the name of each routine before compiling so that each `ConnectMove` routine will be named uniquely.

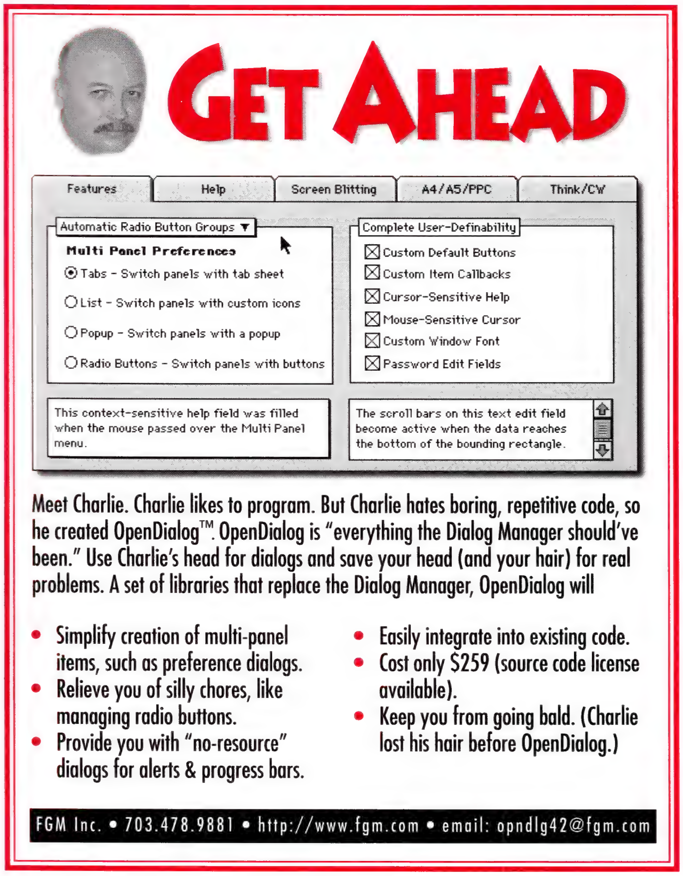
This will be a native PowerPC Challenge, scored using the Symantec environment. Solutions may be coded in C or C++.

Two Months Ago Winner

Perhaps the earlier Challenge deadline caught people a little off guard this month. Whatever the reason, only three people chose to enter the Edge Detector Challenge this month. Congratulations to **Ernst Munter** (Kanata, ON, Canada) for submitting the fastest entry to the Edge Detector Challenge. This is Ernst's third win in the last four contests, and it brings him within 2 points of the lead in our Top Contestants point total.

Contestants were required to process PixMap images in 8-bit, 16-bit, or 32-bit color and identify pixels where the color difference with adjacent pixels exceeded a specified threshold in the specified color component (or combination of components). The second place solution by **Miguel Cruz Picao** was actually faster than the winning solution in two of the three color depth cases, but was slower in the third case and slower overall. Miguel elected to implement entirely separate code for each of the three color depth cases, while Ernst sacrificed some processing time for smaller code size by testing for color depth while processing each line of the image, using common code for the rest of the three cases. On the other hand, Ernst used the `EdgeType` provided as a parameter to select, outside of any loops, the edge detection routine to use for the entire image, while Miguel's code tested the `EdgeType` for each pixel. Ernst elected to make four passes through each pair of adjacent image lines, comparing pixels that were adjacent horizontally, diagonally in each direction, and vertically, allowing compact and efficient comparison loops. The overall result was that the winning solution was some 25% faster than the second-place solution in the 32-bit case, which was enough to make it about 5% faster overall.

Table 1 summarizes the results for each entry, including code size, data size, execution time for each of the three color depth cases, and the overall score based on total execution time. Numbers in parentheses after a person's name indicate that person's cumulative point total for all previous Challenges, not including this one.



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Name	Code	Data	Time (32)	Time (16)	Time (8)	Score
Ernst Munter (154)	1492	116	833	912	723	2467
Miguel Cruz Picao (11)	3420	20	1120	899	582	2600
Greg Cooper	1872	28	1830	1902	1802	5534

Table 1. Results for each entry

Rank Name	Points	Rank Name	Points
1. [Name deleted]	176	11. Mallett, Jeff	44
2. Munter, Ernst	174	12. Kasparian, Raffi	42
3. Gregg, Xan	92	13. Vineyard, Jeremy	42
4. Karsh, Bill	90	14. Lengyel, Eric	40
5. Larsson, Gustav	87	15. Darrah, Dave	31
6. Stenger, Allen	65	16. Brown, Jorg	30
7. Cutts, Kevin	57	17. Lewis, Peter	30
8. Riha, Stepan	51	18. Landry, Larry	29
9. Goebel, James	49	19. Beith, Gary	24
10. Nepsund, Ronald	47	20. Elwertowski, Tom	24

Table 2. Top 20 contestants

Wow!
Oh!
Yeah!
Oo!
Right On!

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TOP 20 CONTESTANTS OF ALL TIME

Table 2 shows the Top 20 Contestants for the Programmer's Challenges to date The numbers below include points awarded for this month's entrants.

There are three ways to earn points: (1) scoring in the top 5 of any Challenge, (2) being the first person to find a bug in a published winning solution or, (3) being the first person to suggest a Challenge that I use. The points you can win are:

1st place	20 points
2nd place	10 points
3rd place	7 points
4th place	4 points
5th place	2 points
finding bug	2 points
suggesting Challenge	2 points

Here is Ernst's winning solution:

EDGEDETECTOR.C

Copyright 1996, Ernst Munter

/*
Problem Statement
—————————-
Given a Pixmap image, create a Bitmap which shows the edges in the image.

Pixmaps may have 8, 16, or 32 bit colors. Parameters control which colors should contribute to the edge detection, and a threshold for the color space difference (an RMS value) to be considered an edge.

All 16 bits of the individual color values must be considered, which can result in 32-bit overflow when squares are added.

Solution
————

The general idea is to process 2-row strips of the image through an intermediate ColorSpec stage in which the "value" fields are used to mark edge pixels.

Step1:

We allocate a small amount of memory, sufficient to hold two rows of pixels in ColorSpec format (8 bytes per pixel). Pixels from each row in the Pixmap are converted to ColorSpec format (RGB + "value").

Step2:

The two lines are scanned with 4 different patterns to determine edges: given 2 rows with pixels as shown

```
  A B C D E F G H ...
  a b c d e f g h ...
```

We compare pixel pairs in four separate runs of EdgePairs():

```
  a-b, b-c, c-d, d-e ...  (WEST - EAST)
  A-b, B-c, C-d, D-e ...  (NORTH-WEST - SOUTH-EAST)
  B-a, C-b, D-c, E-d ...  (NORTH-EAST - SOUTH-WEST)
  A-a, B-b, C-c, D-d ...  (NORTH - SOUTH)
```

This procedure is repeated for rows 0 and 1, then 1 and 2, 2 and 3, and so on. (Plus an West-East run for row 0).

During each run, the "value" field of every pair of pixels found to be part of an edge is set to -1 (0xFFFF). All other values remain at 0.

Step 3:

Before shifting down to the next row, the ColorSpecs of the upper row are scanned to construct a row of the Bitmap.

Optimizations
——————-

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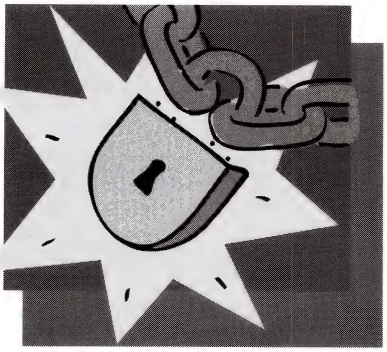

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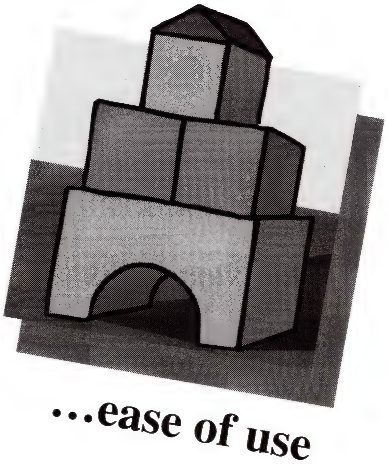

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All pixel types are normalized to a single ColorSpec format by the GetLine procedure.

Different edge types call for different series of tests. Specifically, 1, 2, or 3 colors can be optimized separately. On of a set of 7 separate short functions is selected at runtime. This requires the edge type to be evaluated only once, to select the EdgeXXX procedure that will be used many times as the image is scanned from top to bottom.

Comparing an RMS (root of sum of squares) value with a threshold is equivalent to comparing the sum of squares with the square of the threshold value. This avoids the need to compute square roots.

In the case of a single color edge type, the square of the difference would not need to be formed. A simple comparison of the threshold with the absolute difference would suffice. However, the runtime difference between a multiply and computing the absolute value would depend on CPU type etc, and would tend to be small. I opted for uniformity, and square all differences.

The dynamically allocated storage should typically fit inside the CPU cache, and not slow things down as it is read and written continuously.

Assumptions
——————-
Bitmap is large enough to hold the result. eType is within the range of redOnly to redGreenAndBlue, otherwise the call will certainly crash.

Amount of static memory = 8 pointers (32 bytes)
Amount of dynamic memory required is for 2 rows of ColorSpec records (a 1024 pix wide image -> 16K of storage).

```
*/

#include <QDOffscreen.h>
// Contains PixMap, BitMap and EdgeType defs

#include <stdlib.h>
```

Definitions

```
typedef enum
{
   redOnly = 1,
   greenOnly,
   redAndGreen,
   blueOnly,
   redAndBlue,
   greenAndBlue,
   redGreenAndBlue
} EdgeType;

typedef void EdgeProc(
   ColorSpec*      P,
   ColorSpec*      Q,
   int             size,
   unsigned long   TH);
```

Function Prototypes

```
void EdgeDetect(
   PixMapHandle    pMapH,
   BitMap          *bMap,
   unsigned short  threshold,
   EdgeType        eType);

void GetlLine(
   ColorSpec*      line,
   void*           pix,
   int             size,
   ColorSpec*      CT,
   int             pixelSize);

void EdgeRed(
   ColorSpec*      P,
   ColorSpec*      Q,
   int             size,
   unsigned long   TH);

void EdgeGreen(
   ColorSpec*      P,
   ColorSpec*      Q,
   int             size,
   unsigned long   TH);

void EdgeRedGreen(
   ColorSpec*      P,
   ColorSpec*      Q,
   int             size,
   unsigned long   TH);

void EdgeBlue(
   ColorSpec*      P,
   ColorSpec*      Q,
   int             size,
   unsigned long   TH);

void EdgeRedBlue(
   ColorSpec*      P,
   ColorSpec*      Q,
   int             size,
   unsigned long   TH);

void EdgeGreenBlue(
   ColorSpec*      P,
   ColorSpec*      Q,
   int             size,
   unsigned long   TH);

void EdgeRedGreenBlue(
   ColorSpec*      P,
   ColorSpec*      Q,
   int             size,
   unsigned long   TH);

void Copy2Bitmap(
   ColorSpec*      P,
   unsigned char*  bits,
   int             size);
```

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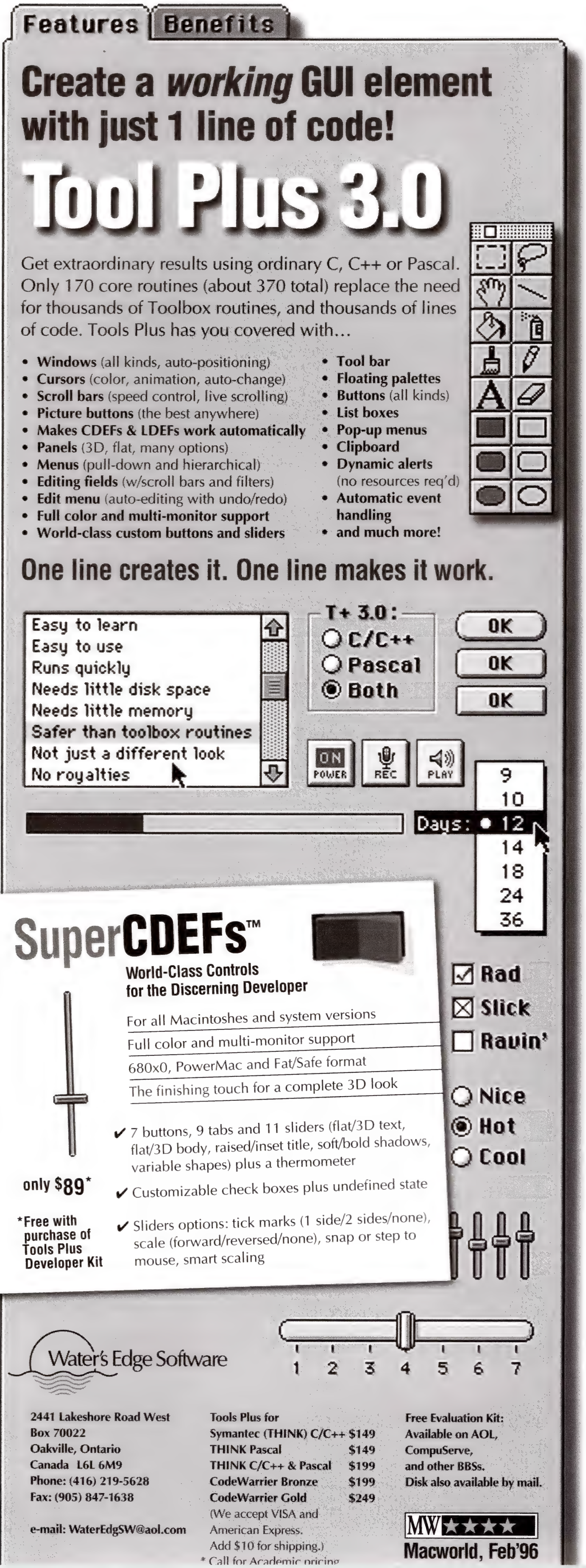

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Static Allocations

```
static EdgeProc* EdgeProcedure[8] = {
  0,
  EdgeRed,
  EdgeGreen,
  EdgeRedGreen,
  EdgeBlue,
  EdgeRedBlue,
  EdgeGreenBlue,
  EdgeRedGreenBlue};
```

EdgeDetect

```
void EdgeDetect(
  PixMapHandle    pMapH,
  BitMap          *bMap,
  unsigned short  threshold,
  EdgeType        eType) {
PixMap*  pm=*pMapH;

unsigned char*  pix=(unsigned char*)GetPixBaseAddr(pMapH);
unsigned char*  bits=(unsigned char*)bMap->baseAddr;
unsigned long   TH=(unsigned long)threshold*threshold;
int    y;
int    pixelSize=pm->pixelSize;
int    pixRowBytes=pm->rowBytes & 0x3FFF;
int    pixInRow=pm->bounds.right-pm->bounds.left;
int    bitRowBytes=bMap->rowBytes;

ColorSpec* allocated;
ColorSpec* line0;
ColorSpec* line1;
ColorSpec* CTable=(*(pm->pmTable))->ctTable;
EdgeProc*  EP;

// Get memory for a 2-row strip of pixels:
  if (0==(allocated=(ColorSpec*)malloc(
  2*sizeof(ColorSpec)*pixInRow))) return;
  line0=allocated-1;   //(we always use pre-increment later)
  line1=line0+pixInRow;

// Determine EdgeProc to use:
  EP=EdgeProcedure[eType];

// Prepare first row:
  Get1Line(line0,pix,pixInRow,CTable,pixelSize);
  (*EP)(line0,line0+1,pixInRow-1,TH);    //W-E

// Process remaining rows:
  for (y=pm->bounds.top+1;y<pm->bounds.bottom;y++) {
    pix+=pixRowBytes;
    Get1Line(line1,pix,pixInRow,CTable,pixelSize);

    (*EP)(line1,  line1+1,pixInRow-1,TH);  //W-E
    (*EP)(line0,  line1+1,pixInRow-1,TH);  //NW-SE
    (*EP)(line0+1,line1,  pixInRow-1,TH);  //NE-SW
    (*EP)(line0,  line1,  pixInRow,TH);    //N-S

// Convert ColorSpec.values to Bitmap.bits:
    Copy2Bitmap(line0,bits,bitRowBytes);

// Swap line0 with line1:
    {ColorSpec* temp=line0;line0=line1;line1=temp;}
    bits+=bitRowBytes;
  }

// Convert the last row;
  Copy2Bitmap(line0,bits,bitRowBytes);

// Release dynamic memory:
  free(allocated);
}
```

Get1Line

```
/***************** Local Functions ***********************/
void Get1Line(
  ColorSpec* line,
  void*      pix,
  int        size,
  ColorSpec* CT,
  int    pixelSize){
```

```
int  i,r,g,b;
unsigned long   x;
  if (pixelSize==8) {
    unsigned char*  PIX =((unsigned char*)pix);
    for (i=0;i<size;i++) {
      x=*PIX++;
      line++;
      *((double*)(line))=*((double*)(CT+x));
      line->value=0;
    }
  } else if (pixelSize==16) {
    unsigned short* PIX =((unsigned short*)pix);
    for (i=0;i<size;i++) {
      x=*PIX++;
      line++;
      r=((x & 0x7C00) << 1)  | ((x & 0x7C00) >> 4) |
  ((x & 0x7C00) >> 9)  | ((x & 0x7C00) >> 14);
      g=((x & 0x03E0) << 6)  | ((x & 0x03E0) << 1) |
  ((x & 0x03E0) >> 4)  | ((x & 0x03E0) >> 9);
      b=((x & 0x001F) << 11) | ((x & 0x001F) << 6) |
  ((x & 0x001F) << 1)  | ((x & 0x001F) >> 4);
      line->value=0;
      line->rgb.red=  (unsigned short)r;
      line->rgb.green=(unsigned short)g;
      line->rgb.blue= (unsigned short)b;
    }
  } else {  //pixelSize not 8 or 16, so it must be 32
    unsigned long*  PIX =((unsigned long*)pix);
    for (i=0;i<size;i++) {
      x=*PIX++;
      line++;
      r=((x & 0xFF0000) >> 8) | ((x & 0xFF0000) >> 16);
      g= (x & 0x00FF00)       | ((x & 0x00FF00) >> 8);
      b= (x & 0x0000FF)       | ((x & 0x0000FF) << 8);
      line->value=0;
      line->rgb.red=  (unsigned short)r;
      line->rgb.green=(unsigned short)g;
      line->rgb.blue= (unsigned short)b;
    }
  }
}
```

Copy2Bitmap

```
void Copy2Bitmap(
  ColorSpec* P,
  unsigned char*  bits,
  int    size) {
int    i;
  P++;
  for (i=0;i<size;i++) {
    *bits = (unsigned char) (
      (P[0].value & 0x80) |
      (P[1].value & 0x40) |
      (P[2].value & 0x20) |
      (P[3].value & 0x10) |
      (P[4].value & 0x08) |
      (P[5].value & 0x04) |
      (P[6].value & 0x02) |
      (P[7].value & 0x01) );
    P+=8;
    bits++;
  }
}
```

EdgeRedGreenBlue

```
void EdgeRedGreenBlue(
  ColorSpec*      P,
  ColorSpec*      Q,
  int             size,
  unsigned long   TH) {
int    i;
unsigned long   delta,acc;
  for (i=0;i<size;i++) {
    P++;Q++;
    acc=(unsigned long)P->rgb.red-Q->rgb.red;
    acc*=acc;
    delta=(unsigned long)P->rgb.green-Q->rgb.green;
    delta*=delta;
    acc+=delta;
    if (acc<delta) {P->value=Q->value=-1;continue;}
    delta=(unsigned long)P->rgb.blue-Q->rgb.blue;
```

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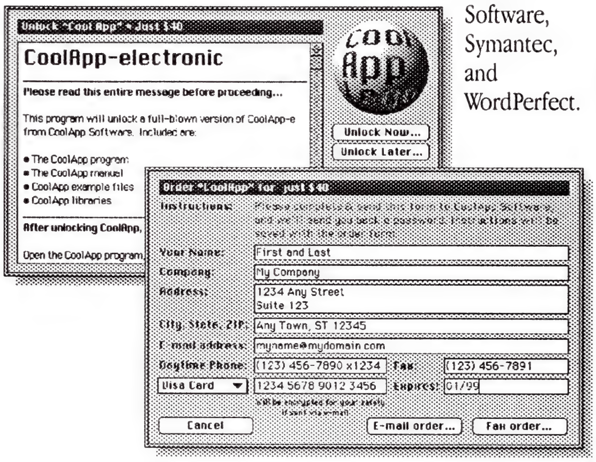

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```
    delta*=delta;
    acc+=delta;
    if ((acc>=TH) || (acc<delta)) P->value=Q->value=-1;
  }
}
```

EdgeGreenBlue

```
void EdgeGreenBlue(
  ColorSpec*      P,
  ColorSpec*      Q,
  int             size,
  unsigned long   TH) {
int    i;
unsigned long  delta,acc;
  for (i=0;i<size;i++) {
    P++;Q++;
    acc=(unsigned long)P->rgb.green-Q->rgb.green;
    acc*=acc;
    delta=(unsigned long)P->rgb.blue-Q->rgb.blue;
    delta*=delta;
    acc+=delta;
    if ((acc>=TH) || (acc<delta)) P->value=Q->value=-1;
  }
}
```

EdgeRedBlue

```
void EdgeRedBlue(
  ColorSpec*      P,
  ColorSpec*      Q,
  int             size,
  unsigned long   TH) {
int    i;
unsigned long  delta,acc;
  for (i=0;i<size;i++) {
    P++;Q++;
    acc=(unsigned long)P->rgb.red-Q->rgb.red;
    acc*=acc;
    delta=(unsigned long)P->rgb.blue-Q->rgb.blue;
    delta*=delta;
    acc+=delta;
    if ((acc>=TH) || (acc<delta)) P->value=Q->value=-1;
  }
}
```

EdgeRedGreen

```
void EdgeRedGreen(
  ColorSpec*      P,
  ColorSpec*      Q,
  int             size,
  unsigned long   TH) {
int    i;
unsigned long  delta,acc;
   for (i=0;i<size;i++) {
    P++;Q++;
    acc=(unsigned long)P->rgb.red-Q->rgb.red;
    acc*=acc;
    delta=(unsigned long)P->rgb.green-Q->rgb.green;
    delta*=delta;
    acc+=delta;
    if ((acc>=TH) || (acc<delta)) P->value=Q->value=-1;
  }
}
```

EdgeBlue

```
void EdgeBlue(
  ColorSpec*      P,
  ColorSpec*      Q,
  int             size,
  unsigned long   TH) {
int    i;
unsigned long  acc;
  for (i=0;i<size;i++) {
    P++;Q++;
    acc=(unsigned long)P->rgb.blue-Q->rgb.blue;
    acc*=acc;
    if (acc>=TH) P->value=Q->value=-1;
  }
}
```

EdgeGreen

```
void EdgeGreen(
  ColorSpec*      P,
  ColorSpec*      Q,
  int             size,
  unsigned long   TH) {
int    i;
unsigned long  acc;
  for (i=0;i<size;i++) {
    P++;Q++;
    acc=(unsigned long)P->rgb.green-Q->rgb.green;
    acc*=acc;
    if (acc>=TH) P->value=Q->value=-1;;
  }
}
```

EdgeRed

```
void EdgeRed(
  ColorSpec*      P,
  ColorSpec*      Q,
  int             size,
  unsigned long   TH) {
int    i;
unsigned long  acc;
  for (i=0;i<size;i++) {
    P++;Q++;
    acc=(unsigned long)P->rgb.red-Q->rgb.red;
    acc*=acc;
    if (acc>=TH) P->value=Q->value=-1;
  }
}
```

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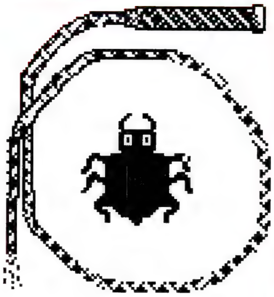
Information

The Debugger V2 & MacNosy

by Steve Jasik



Control

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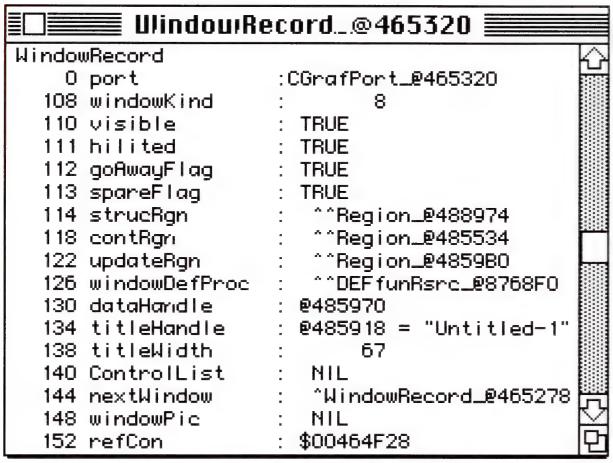

```
WindowRecord_@465320
WindowRecord
   0 port           :CGrafPort_@465320
 108 windowKind     :        8
 110 visible        : TRUE
 111 hilited        : TRUE
 112 goAwayFlag     : TRUE
 113 spareFlag      : TRUE
 114 strucRgn       :  ^^Region_@488974
 118 contRgn        :  ^^Region_@485534
 122 updateRgn      :  ^^Region_@4859B0
 126 windowDefProc  :  ^^DEFfunRsrc_@8768F0
 130 dataHandle     : @485970
 134 titleHandle    : @485918 = "Untitled-1"
 138 titleWidth     :       67
 140 ControlList    :  NIL
 144 nextWindow     :  ^WindowRecord_@465278
 148 windowPic      :  NIL
 152 refCon         : $00464F28
```

An example of a structured data display window with hypertext links to substructures

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By Mike Scanlin

Code Fragments Explained

A shared library of procedure pointers for the resourceful programmer

**A Fragment of Your Imagination:
Code Fragments and Code Resources
for Power Macintosh and
Macintosh Programmers**
By Joe Zobkiw
Addison-Wesley, 1995. ISBN 0-201-48358-0.
500 pages (softback with CD ROM). $39.95.

Have you looked at how big the complete set of *Inside Macintosh* books is nowadays? My incomplete set is over two feet wide and growing. (I prefer paper to on-line help.) Does the very voluminosity of this documentation, as Frederick Brooks of *Mythical Man-Month* fame would say, represent some new kind of incomprehensibility? I'm not sure. While I find *Inside Macintosh* indispensable, I also find it somewhat unwieldy at times. Fortunately, there are other, more readable sources of truth available. *A Fragment of Your Imagination* is one such source.

This book is a kind of a "Cliff's Notes" for the Code Fragment Manager. It presents you with discussion and source code for any type of code fragment you might want to write: LDEFs, CDEFs, WDEFs, INITs, XMCDs, cdevs, thngs, plug-ins, etc. As do most programming books, it comes with a CD-ROM bearing all the source code in the book plus a version of CodeWarrior Lite.

There's little doubt that anyone who wants to write a 68K, PPC or fat code fragment would find it useful to have a piece of working sample code to start with. That's the primary purpose of this book. It gives you examples of each type of code fragment (LDEF, CDEF, etc.) for each environment (68K, PPC, fat). When you think about it, there's not much that can be said on the subject of stand-alone code fragments. Once you've written one or two you pretty much get it and you're on your way. But it's nice to have some hand-holding for that first one, and that's what this book does.

I like the fact that this book focuses on useful examples. The entire second half of the book is source code listings. The first few chapters cover the basics of the Mixed Mode Manager, Universal Procedure Pointers and Shared Libraries. After that, the author gets right into it by showing you how to write a fat INIT called MenuScript that allows you to replace any menu item in any program with an AppleScript. Each of the next eight chapters covers a different type of code resource, explaining the special cases that come up for each kind of code fragment, along with some example source on how to deal with it.

The examples in the book are reasonable. They are one or two steps above minimum working examples, which is what you want in a code example. If you're trying to learn how to patch a trap, for instance, you don't need 1000 lines of unrelated code. You just want the minimum to get the job done, plus a little visual feedback code to make sure it's being called. The author starts most sections by giving you the bare minimum of code necessary to write a particular type of code fragment. He explains how this bit of glue code makes the code fragment work. Then he adds a bit of unrelated code that does something visual so you'll know the code is being called and working. It's a good way to learn what the minimum code for a particular fragment type is.

While I liked the straightforward examples, completeness and screen shots, there are some things I did not like. There are too many cute expressions and attempts at humor. For example: "The termination routine couldn't be much simpler without breaking a law or two." I guess the author is trying to make the book friendly or funny, but there are so many of these lines that they come off as a bit childish.

After reading the book I couldn't help but think that it was physically much larger than it needed to be. The outer margins

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are over two inches wide, but that space is never used for anything. And the leading (vertical space between lines) in the source code examples is too large. I'd rather see more lines of code on the same page so I don't have to turn so many pages when studying it. By the same token, the commenting style he uses in the second half of the book really spaces the code out vertically. I'd rather have it more compact. Overall, I couldn't help but feel that the author was told to write a 500-page book and was only able to produce 300 or so pages.

Despite my nit-picking, I have to say this book does the job it set out to do – inform Macintosh programmers (who have a bit of Mac programming experience already) on how to write many kinds of code fragments. It's a nice distilled version of the relevant tech notes, DTS examples, and *Inside Macintosh.* I would definitely recommend it for your first or second code fragment. But if you've already done a few of those you probably won't get much out of this book.

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JAVATECH™

By Kevin M. Savetz

Getting the Jump on JavaScript

Start learning to add life to your Web pages

Static Web pages are a dying breed. Although not obsolete yet, it may be one day soon that a Web page that doesn't do anything just won't get a second glance. Once upon a time, all Web pages were static. CGI programs started to change that by allowing powerful searches of Web pages, sites that modified themselves based on the time of day or the phase of the moon, and even interactive games. Java, a powerful programming language, is bringing a whole new level of interactivity to the Web. Somewhere in the middle is JavaScript, a new language that's simple enough for beginning programmers to learn, but powerful enough to interact with Web pages and Java applets in ways previously not possible with any language.

JavaScript is a fledgling language. As I write this, JavaScript isn't even complete. The technical specifications of the language have been agreed upon, but no Web browsers completely support JavaScript. (JavaScript 3.0, which should incorporate the functions that are currently lacking, is due out in June, give or take a month; no firm date had been set at press time.) But that doesn't mean that no one is using it; bleeding-edge Web hackers have been experimenting with the crippled JavaScript for months, and many are impressed with what they see.

WHAT IS JAVASCRIPT?

Java and JavaScript are distinct languages, with different purposes and features. JavaScript was designed to provide an easy way for Web authors to create interactive Web pages. Java is a programming language which is used to create stand-alone applications, called applets. Unlike Java, which is meant for experienced programmers with an understanding of C++, JavaScript is a simpler "scripting" language (like dBASE and AppleScript) aimed at those with less programming experience.

Both are powerful languages, but they each offer distinct functionalities. According to Andy Augustine, vice president of technology for Frequency Graphics, a Web development and hosting service provider, "JavaScript is aimed at the people who don't have C++ experience, people who don't have much experience with CGI, but want to create some sort of interactive Web page."

"Contrary to popular misconceptions, JavaScript was not meant to be a scaled-down version of Java, nor was it intended to be a replacement for CGI (server-side) scripts. Instead, JavaScript functions as an outstanding way to enhance both," he said.

JavaScript can be used to manage user input as well as to show text, play sounds, display images, or communicate with a plug-in in response to "events" such as a mouse-click or exiting or entering a Web page.

JavaScript's syntax is loosely based on the Java language, but those who have used both languages say the similarity is very loose indeed. In fact, the closest resemblance the two languages have is their names. JavaScript was originally called Mocha while being developed at Netscape. It was later dubbed LiveScript, and when Netscape Communications partnered with Sun to develop Java, LiveScript was renamed JavaScript.

Kevin Savetz is author of *MBONE: Multicasting Tomorrow's Internet*, published by IDG books and waiting patiently on a bookshelf near you. You can visit Kevin's Web page at `http://www.northcoast.com/savetz/` or reach him at savetz@northcoast.com.

JAVA VS. JAVASCRIPT

JavaScript programs are interpreted and run entirely on the client side. This means fewer hits and less processing time on the server than with Java (where applets are compiled on the server before being executed on the client) or CGI (which requires the server to do the work and rack up hits).

There are other differences between the two languages. In Java, applets are files distinct from HTML pages; with JavaScript, the code is integrated into the HTML using special tags. (This can cause problems with some Web browsers that do not properly handle JavaScript code.) Like Java, JavaScript is a cross-platform language that can work with any compatible browser.

Here's an example HTML file with an embedded JavaScript. Between the `<BODY>` tags, the Web browser displays a form with a space to enter a number. When the user enters a number in the field, the browser starts the script, located between the `<SCRIPT>` tags. The script itself makes sure the user really entered a number, and displays a dialog box if the user didn't keep the number within pre-defined limits.

```
<HEAD>
<SCRIPT LANGUAGE="JavaScript">
<!--- these comments should hide the script from old browsers
function checkNum(str, min, max) {
  if (str == "") {
    alert("Enter a number in the field, please.")
    return false
  }
  for (var i = 0; i < str.length; i++) {
    var ch = str.substring(i, i + 1)
    if (ch < "0" || ch > "9") {
      alert("Enter a number, please.")
      return false
    }
  }

  var val = parseInt(str, 10)
  if ((val < min) || (val > max)) {
    alert("Try a number from 1 to 10.")
    return false
  }
  return true
}

function thanks() {
  alert("Thank you.")
}
// end hiding from old browsers -->
</SCRIPT>
</HEAD>

<BODY>
<FORM NAME="ex5">
Please enter a number from 1 to 10:
<INPUT NAME="num"
  onChange="if (!checkNum(this.value, 1, 10))
    {this.focus();this.select();} else {thanks()}">
</FORM>
</BODY>
```

All this only takes one hit on the server – to download the HTML code and the embedded script. Doing this with a CGI script would require multiple hits on the server, once for the HTML file, and again to verify the input every time the user types into the form. JavaScript allows the client to perform more significant calculations without weighing down the server.

Other differences are more technical. JavaScript is object-based: its code uses built-in, extensible objects, but unlike Java, there are no classes or object inheritance. In JavaScript, object references are checked at run-time; in Java, object references must exist upon compilation. In JavaScript, variable data types are not declared, unlike in Java, where they must be declared before use.

Which language is better? Until a JavaScript interpreter is complete, there is no fair comparison. Although it was originally intended as a tool for fledgling programmers, even experienced programmers who know Java will find JavaScript useful. The languages can work together to complement each other.

Currently, the only Web browser with any support for JavaScript is Netscape 2.0, and it lacks much of the functionality promised for the final release. More than 30 other companies, including Microsoft, have agreed to include support for JavaScript in their Web browsers. With the current version of JavaScript, you can send information to the browser (such as a dialog box) and get the status of objects (such as mouse movements), but some of the most exciting functions, such as the abilities to read input streams from documents and to interact with Java applets, are still unimplemented.

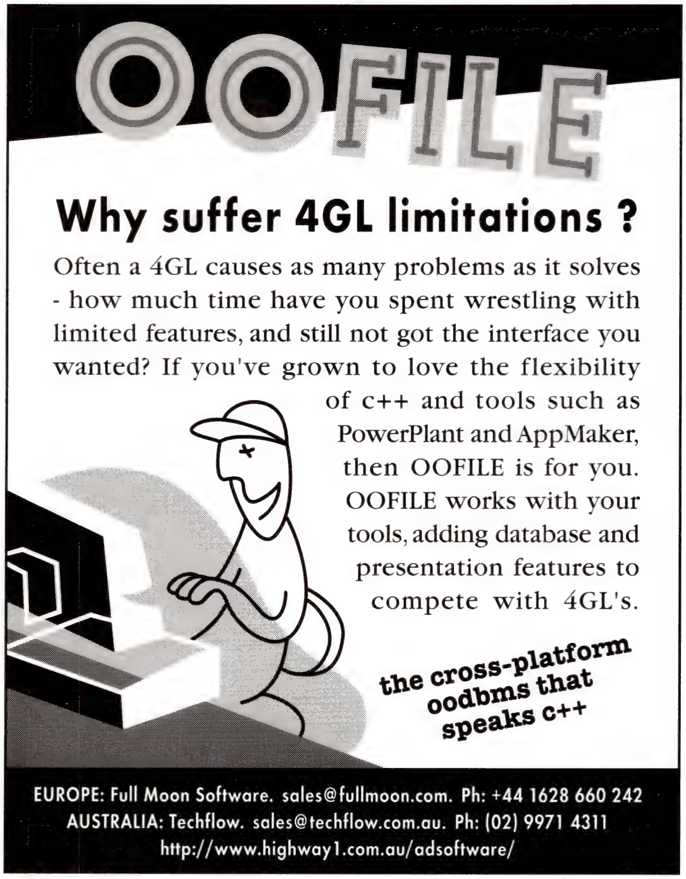
When JavaScript includes all of the tools the specs say will be included, including something called the "applet object" (which will allow scripts to interact with Java applets), the two languages will be a mighty team. "As soon as the applet object is released, you will be able to control Java applets with JavaScript, and that will make them work perfectly together," Augustine says. This means that you will be able to control a Java applet using a Web-based form, with a JavaScript doing the behind-the-scenes translation between the Web page and the applet. The user will be able to use a radio button to select how a Java applet will run – for instance, changing the color and speed of a rotating logo. JavaScript will pass information from the form to the Java applet. JavaScript's applet object will also allow scripts to send information to and get information from other scripts and CGI programs.

Another tool that will be available in the final release of JavaScript is the "history object", which will allow the script to see what Web pages the user has recently visited (although to protect the user's privacy, the script will not be able to share that information with the server). This would allow a page to offer an intelligent "back" button, letting the user move quickly back to any previously visited Web page.

As with Java, security in JavaScript is likely to be an ongoing battle. Several security problems were quickly discovered in JavaScript 2, including a bug that let JavaScript send a blank electronic mail message to someone without the sender's knowledge. Another bug allowed JavaScript to get a listing of files on the user's hard drive (although the script could not read the contents of any files).

NOW OR LATER?

Should you bother learning JavaScript now, or is it currently just a toy for experimenters? Should you wait until the final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version of the JavaScript interpreter ships before trying to learn the ins and outs of the language? Augustine thinks that now is the time to get a jump start on JavaScripting. "Learn JavaScript right now if you want to capture the market while it is viable; you'll be ahead of the field. If you wait until it is fully functional before you learn it, I think you'll be behind the game," he says. Online tutorials can get you started with the basics of the language, and Internet mailing lists and newsgroups devoted to the topic are already home to thriving communities of developers and experimenters.

Will the serious Web page developer need to understand both Java and JavaScript? Because JavaScript can interact directly with the user anywhere on a Web page (rather than being limited to a single window, as with Java), most Java developers will probably want to learn both. But JavaScript should also be viable as a stand-alone tool for less experienced programmers who want to add interactivity to their Web pages.

EXAMPLE SCRIPTS

There are already dozens of example JavaScripts on the Web. Many, such as the 1040EZ tax form and body mass calculator, simply compute values input from an HTML form. Others are more inspired, such as the currency exchange calculator, which lets you select two countries from a list and then computes the exchange rate. I am particularly fond of the Zen koan generator, even though it occasionally causes Netscape 2.0 to crash.

http://www.homepages.com/fun/1040EZ.html
http://www.iohk.com/UserPages/acheng/javascript.html
http://www.superprism.net/doc/EXPRESS/util/currency.html
http://www.wrldpwr.com/javascriptzen.html

The color picker shows how JavaScript can work with frames and color: pass the mouse over the name of a color in one frame and the background of another frame will become that color. Other examples are downright inspirational, such as the JavaScript VRML clock, which uses JavaScript to display a three-dimensional clock if you have a VRML browser.

http://www.lsi.usp.br/doc/color/picker.html
http://www.phoenix.net/~jalonso/applets/vrml

Many more example applications are available at http://www.gamelan.com/.

Remember how interesting (and sometimes annoyingly funky) Web pages became when authors started using and abusing sundry new tools like backgrounds and frames? Expect to see another round of enlightening and obscure Web sites as developers and hackers begin to understand and use JavaScript.

FOR MORE INFORMATION

A growing number of information sources about JavaScript are online. Andy Augustine's JavaScript FAQ is at:

http://www.freqgrafx.com/411/jsfaq.html

There is also a JavaScript mailing list, a high-volume, sometimes technical list for discussion about using the language. To subscribe, send a message to majordomo@obscure.org with a message body of "subscribe javascript". A digest version of the list is also available. To subscribe, use a message body of "subscribe javascript-digest". Further discussion takes place on the newsgroup comp.lang.javascript.

Netscape's official JavaScript documentation is required reading if you plan to learn your way around JavaScript. The files are also downloadable for reading offline.

http://home.netscape.com/eng/mozilla/2.0/handbook/javascript/index.html
http://home.netscape.com/eng/mozilla/2.0/handbook/javascript/jsdoc.zip

Augustine maintains a list of online tutorials, example applications and other information at JavaScript 411. Finally, the ubiquitous Yahoo naturally has an index of JavaScript-related goodies.

http://www.freqgrafx.com/411/
http://www.yahoo.com/Computers_and_Internet/Languages/JavaScript/

UNIFORM RESOURCE LOCATORS

By Jim Straus, URLs@mactech.com

Welcome to the latest update on Macintosh/Internet information. This month we have several Internet magazines or e-zines as well as information on Apple's Game Sprockets APIs. As always, there is Internet stuff and programmer resources at your finger tips. Or spare your fingers and find the full list online at:
http://www.mactech.com/URLs.html

Latest Updates

Internet Related

Mac Internet Server Software	http://www.cen.uiuc.edu/~wronkiew/macos_servers/
MacJava Development	http://www1.omi.tulane.edu/adowns/decaf
MacJava Discussion Group	http://www.mactivity.com/java/java_discussion.html

New Technologies

Game Sprockets	http://dev.info.apple.com/evangelism/games/games.html

Other Programmer Resources

Conflict Compendium	http://www.islandnet.com/~quill/c3data.html
Emerald Ventures	http://www.dataphone.se/~punt/emve.html
Mac Hacking and Cracking	http://www.netaxs.com/~hager/machack.html
OpenDoc eZine	http://www.partmerchant.com/odz/
PowerPlant Beginners	http://www.interlog.com/~breakpt/html/powerplant.html

Vendors, Products and Miscellaneous

Absolute Mac	http://www.ie2.u-psud.fr/~peirano/mac_us.html
AppMaker	http://members.aol.com/bowersdev/
Casady & Greene	http://205.179.133.2/C&G/Welcome.html
Mac-o-mania	http://remus.rutgers.edu/~euge/mac.html
Mac Related Sites	http://www.net-army.com/mac/
MacSense Magazine	http://www.macsense.com/MacSense/
MacUser Magazine	http://www.zdnet.com/macuser/
Read Me 1st	http://www.idir.net/~jgamble/

Internet

If you want to serve information on the Internet, and are not sure what you will need, you should check out Mac Internet Server Software. It lists Web servers, ftp servers, gopher servers, mail servers, telnet servers, finger servers, domain name servers – anything you could ask for. Each server is rated for compatibility with MacTCP and Open Transport. Also included are some links useful for people setting up servers. An excellent resource.
Mac Internet Server Software
http://www.cen.uiuc.edu/~wronkiew/macos_servers/

It seems that we cannot go a month without more Java sites. I am not going to say much about them, just mention them.
MacJava Development **http://www1.omi.tulane.edu/adowns/decaf**

MacJava Discussion Group
http://www.mactivity.com/java/java_discussion.html

Macintosh

First off, if you have not seen it yet, you need to look in on the Apple's Game Sprockets site. This is not the Sprocket™ application framework by *MacTech Magazine*, but the Apple's Game Sprockets APIs. Included are Network Sprockets, QuickDraw 3D Sprockets, Speech Sprockets, Draw Sprockets, Sound Sprockets and Input Sprockets. "Sure," you say, "these are just *Inside Macintosh*." Actually, they are SDKs with sample applications, docs, and project frameworks. If you are interested in games on the Mac (or on the Pippin), this is the place for you.
Sprockets (Game APIs)
http://dev.info.apple.com/evangelism/games/games.html

If you are looking for more OpenDoc information, read OpenDoc eZine (ODZ). This is a nice-looking Web-based publication that is devoted to OpenDoc. Be warned, it covers not only OpenDoc for the Macintosh, but the other OpenDoc platforms as well.
OpenDoc eZine **http://www.partmerchant.com/odz/**

For a more mainstream Macintosh e-zine, check out MacSense. It looks to be professionally assembled, and has up-to-the-minute information. Besides pointers to the latest news, there are reviews, columns, editorials, and even letters to the editor. This is a great source for learning about what is going on in the Mac community.
MacSense Magazine **http://www.macsense.com/MacSense/**

Neat non-Macintosh site of the Month

Whether you are a beginner or an expert Internet user, sometimes you will run into trouble and need help. Help can be found at the Internet Help Desk. If you are getting error messages back when trying to read mail, or problems fetching a file, this is the spot. Even if you are not confused by something, you should check in some time. You might learn some new way to do something, or learn about some aspect of the Internet unknown to you. It is not Macintosh-specific, but it has lots of help. A great reference!
The Internet Help Desk **http://w3.one.net/~alward/**

Well, that is it for this month. As always, if you find something interesting, or have updates, send them to URLs@MacTech.com.

Thanks this month to Spec Bowers, Jonathan Hirshon, Lukas Hjalmar, Darren King, Peirano Philippe, David L. Slipp, Matt Wronkiewicz, and many others for their contributions for their suggestions and pointers to new and old sites.

PROGRAMMING TOOLS

By Rich Parker

Tools Plus 3.0

Paradise for "control" freaks

EVERYONE WANTS TO PROGRAM THE MAC

Almost all Mac owners, at one point or another, harbor a desire to program their own machine. Some may be well served by products like HyperCard, but others just can't wait to learn C, C++, or Pascal, so that they can write the next "killer" application.

If they start programming by buying books that illustrate programs that use the standard ANSI libraries, they might make quite a bit of progress in learning the language and writing routines that use a "console" interface. At some point, though, the realization sinks in that these aren't "real" Mac applications, and then the trouble begins. The age-old question that I see over and over again on the online services is: "How do I get started writing 'real' Mac programs?"

Most people are directed to read one of Dave Mark's or Dan Sydow's fine books on the subject of Mac programming for their favorite language, but these books provide only the basic information needed to write "real" Mac programs. At some point, the (now quite distressed) user is directed to the almighty gospel of *Inside Macintosh* to further his or her knowledge. This is the point at which most budding programmers wimp out, and I don't really blame them. I think you will agree that trying to learn to program the Mac by reading *Inside Macintosh* is like learning to play the piano by studying the details of music composition.

SO WHAT'S THE ALTERNATIVE?

I think it's well known in the developer community that I favor the use of application frameworks. Developing Mac applications using PowerPlant, TCL, or MacApp is something that comes easily to me. But I also recognize the negative aspects of these frameworks, and readily admit that they are not a solution for all people or all applications.

In the first place, most application frameworks demand much more memory than would be required if one had the time to read, understand, and apply all of the appropriate built-in Mac toolbox routines to the problem. But the difficulty of understanding the Mac toolbox is equaled only by the steep learning curve of most of the current application frameworks. So we are left with an almost insoluble problem – whether to spend endless hours reading *Inside Macintosh* or to spend equally endless hours studying the structure and functionality of an application framework.

TOOLS PLUS TO THE RESCUE!

Steve Makohin, Steven Waters, and the folks at Water's Edge Software realized that programming the Mac wasn't easy. After all, they ran into these problems themselves when they first started. So they set out to create a set of high-level functions that would enable others to program the Mac much more easily, without having to worry about handling some of the more difficult aspects of Mac programming. The result was a set of binary libraries that could be included in projects for your

Rich Parker is a book author and software developer in Modesto, CA. He spends his time writing programming books for both the Macintosh and Windows platforms. He is currently involved in a new book project and has little free time. He is also a lover of all computer languages, especially object-oriented dynamic languages. His latest book for the Mac, *Mastering the THINK Class Library*, is available at technical bookstores and through Developer Depot. If you would like to write to Rich, asking a question or correcting a mistake, please feel free to do so. Rich can be reached on CompuServe at 76556,1132 or on the Internet at rparker@s2.sonnet.com.

favorite development environment, whose routines could be called to implement and manage exceedingly sophisticated Mac user interfaces. (After all, it's the user interface that is the most complex aspect of any Mac application development.)

The first Tools Plus product was developed as a result of an R&D project in 1989. By 1992, after considerable prodding from various contractors and project managers, Makohin and Waters decided to polish their product to commercial readiness. A year later, Water's Edge Software was formalized to become the delivery vehicle for Tools Plus, and to support its users.

The product has been continually enhanced, and version 3.0 of the Tools Plus product is even more capable than any previous version. It comes with a wealth of features that promise to make almost any Mac programming project a pleasure, rather than a pain.

WHAT'S IT ALL ABOUT?

Tools Plus version 3.0 consists of a set of GUI Building/Event-Managing libraries for Macintosh programmers using any of the following compilers:

- Metrowerks CodeWarrior C/C++ and CodeWarrior Pascal for either 680x0-based or Power Macintosh systems. All versions of CodeWarrior from 6.0 through 8.0 are supported. The Power Mac libraries are native for both C/C++ and Pascal.
- THINK Pascal version 4.0.2 or later for 68K development only.
- THINK C version 5.0.4 or later for 68K development only.
- Symantec C/C++ version 6.0.1 or later for 68K development only. This includes the newly released Symantec version 8.1, which supports 68K development with the Symantec Project Manager; however, in contrast to the CodeWarrior situation, where the PPC-native Tools Plus libraries have been available since mid-1995, native Power Macintosh libraries are not yet available in version 3.0 of Tools Plus for the SPM. [*Portions of the Tools Plus source are in Pascal, and until recently there wasn't SPM PPC-native Pascal support. Water's Edge feels that the LS Pascal translator needs some maturing before they can release the code it generates. – man*]

To use the Tools Plus product, you include the libraries and the `ToolsPlus.c` file in your Symantec or Metrowerks project (the `ToolsPlus.h` file is also needed). In the case of Pascal-based projects, the `ToolsPlus.p` file is added to the project along with the ToolsPlus libraries. Starter project files and all other requisite files (e.g., `ToolsPlus.c`, `ToolsPlus.h`, `ToolsPlus.p`) are provided in the product that you purchase. The products offered by Water's Edge are as follows:

- Libraries for Symantec compilers (68K only), including THINK C and SPM v8.1 ($149).
- Libraries for the THINK Pascal compiler for 68K development ($149).
- Libraries for both THINK C/SPM and THINK Pascal for 68K development ($199).
- Libraries for Metrowerks CodeWarrior Bronze (68K only), including C, C++, and Pascal ($199).
- Libraries for Metrowerks CodeWarrior Gold (68K and PPC), including C, C++, and Pascal ($249).
- Tools Plus v3.0 Academic for any of the foregoing environments ($99 each).
- Super CDEFs, a collection of special "Control Definition" resources that you can include in your applications for any Macintosh ($89 when purchased alone, $39 for those with an academic discount, or free with the purchase of any non-academic Tools Plus developer kit).

WHAT FEATURES DO THE LIBRARIES PROVIDE?

The Tools Plus libraries provide a comprehensive set of user interface elements and event-management features. Every control is created with a single statement in your application. The user interface elements include windows of various types, including all standard window types, floating palettes, movable modal dialogs, buttons, editing fields, raised or sunken 3D panels, and many other features. The best way to show you some of the things you're likely to use is to display some screen shots of the Demo program that ships with every copy of the Tools Plus product, and is also available on all of the major

Macintosh® Common Lisp **Digitool**

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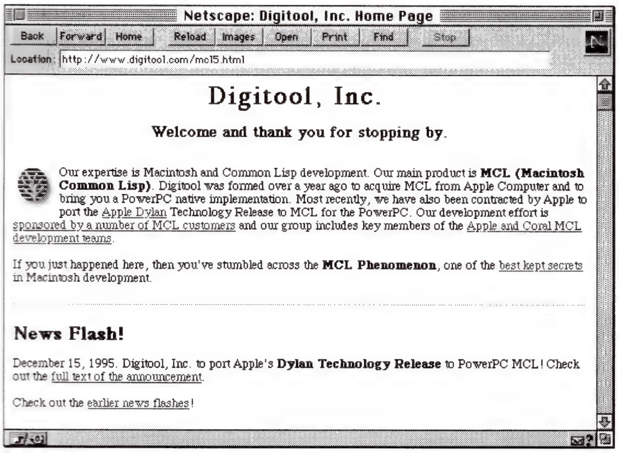
http://www.digitool.com/mcl5.html



Netscape: Digitool, Inc. Home Page
Back
Forward
Home
Reload
Images
Open
Print
Find
Stop
Location: http://www.digitool.com/mcl5.html

Digitool, Inc.

Welcome and thank you for stopping by.

Our expertise is Macintosh and Common Lisp development. Our main product is **MCL (Macintosh Common Lisp)**. Digitool was formed over a year ago to acquire MCL from Apple Computer and to bring you a PowerPC native implementation. Most recently, we have also been contracted by Apple to port the Apple Dylan Technology Release to MCL for the PowerPC. Our development effort is sponsored by a number of MCL customers and our group includes key members of the Apple and Coral MCL development teams.

If you just happened here, then you've stumbled across the **MCL Phenomenon**, one of the best kept secrets in Macintosh development.

News Flash!

December 15, 1995. Digitool, Inc. to port Apple's **Dylan Technology Release** to PowerPC MCL! Check out the full text of the announcement.

Check out the earlier news flashes!

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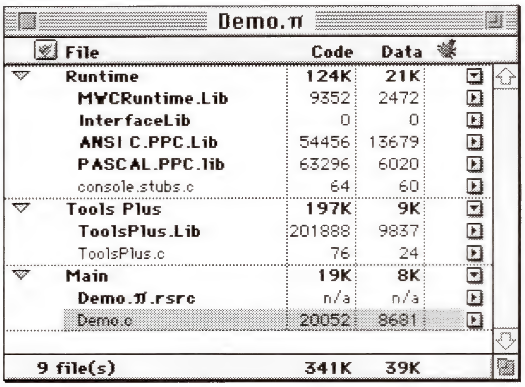
online services (along with its source code). I built the demo application inside CodeWarrior version 8.0 for the PowerMac. The project file for that build is shown in Figure 1. You can see from the figure that the Demo program's project file contains several of the standard Metrowerks libraries, as well as the `Tools Plus.Lib` library. The Demo program is 228K in size and runs in a partition of 384K. It includes examples of many of the features that are available in the Tools Plus product.

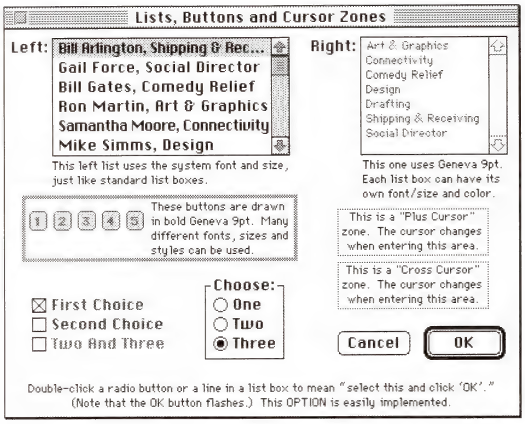


Demo.π

File	Code	Data
▽ **Runtime**	**124K**	**21K**
MWCRuntime.Lib	9352	2472
InterfaceLib	0	0
ANSI C.PPC.Lib	54456	13679
PASCAL.PPC.lib	63296	6020
console.stubs.c	64	60
▽ **Tools Plus**	**197K**	**9K**
ToolsPlus.Lib	201888	9837
ToolsPlus.c	76	24
▽ **Main**	**19K**	**8K**
Demo.π.rsrc	n/a	n/a
Demo.c	20052	8681
9 file(s)	**341K**	**39K**

Figure 1. CodeWarrior project file for Demo program

The window in Figure 2 describes itself. When you move the cursor into the "Plus" cursor zone, the cursor changes into a plus-sign. When you move the cursor into the "Cross" cursor zone, the cursor changes into a cross. The lists demonstrate the use of different fonts with text in any selected color, and the buttons demonstrate the ability to create both standard and non-standard buttons. The checkboxes in the lower left corner demonstrate the ability to disable the "Two And Three" checkbox while the "Second Choice" checkbox is unchecked.



Lists, Buttons and Cursor Zones

Left:
Bill Arlington, Shipping & Rec...
Gail Force, Social Director
Bill Gates, Comedy Relief
Ron Martin, Art & Graphics
Samantha Moore, Connectivity
Mike Simms, Design

This left list uses the system font and size, just like standard list boxes.

Right:
Art & Graphics
Connectivity
Comedy Relief
Design
Drafting
Shipping & Receiving
Social Director

This one uses Geneva 9pt. Each list box can have its own font/size and color.

These buttons are drawn in bold Geneva 9pt. Many different fonts, sizes and styles can be used.

This is a "Plus Cursor" zone. The cursor changes when entering this area.

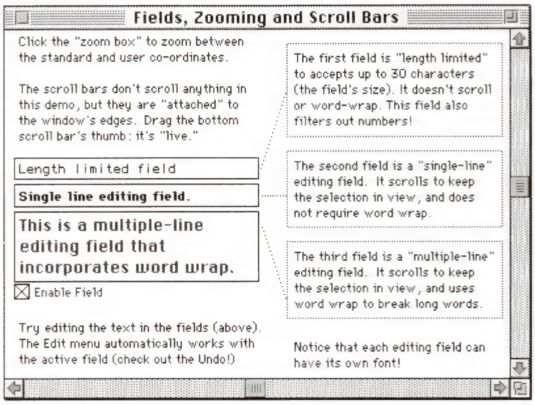
This is a "Cross Cursor" zone. The cursor changes when entering this area.

☒ First Choice
☐ Second Choice
☐ Two And Three

Choose:
○ One
○ Two
● Three

Double-click a radio button or a line in a list box to mean "select this and click 'OK'." (Note that the OK button flashes.) This OPTION is easily implemented.

Figure 2. One of the Demo program's feature demonstrations



Fields, Zooming and Scroll Bars

Click the "zoom box" to zoom between the standard and user co-ordinates.

The scroll bars don't scroll anything in this demo, but they are "attached" to the window's edges. Drag the bottom scroll bar's thumb: it's "live."

Length limited field

Single line editing field.

This is a multiple-line editing field that incorporates word wrap.

☒ Enable Field

Try editing the text in the fields (above). The Edit menu automatically works with the active field (check out the Undo!)

The first field is "length limited" to accepts up to 30 characters (the field's size). It doesn't scroll or word-wrap. This field also filters out numbers!

The second field is a "single-line" editing field. It scrolls to keep the selection in view, and does not require word wrap.

The third field is a "multiple-line" editing field. It scrolls to keep the selection in view, and uses word wrap to break long words.

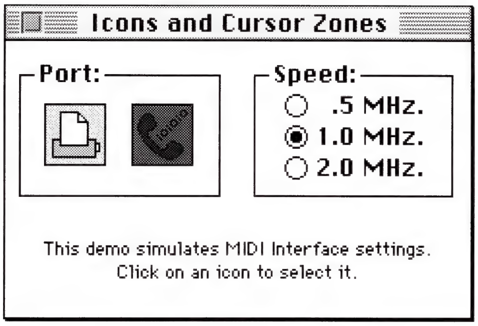
Notice that each editing field can have its own font!

Figure 3. More features from the Demo program

In Figure 3, various types of text field are shown. It also demonstrates the use of "live" scroll bars: instead of displaying a "ghost" outline of the thumb when it is dragged, the thumb of the horizontal scroll bar is redrawn in real time as you drag it. (The thumb of the vertical scroll bar displays the normal appearance of an outline when the thumb is dragged.)

Figure 4 simulates a setup window for a MIDI interface, with the two icon buttons selecting a port and the three radio buttons selecting the interface's speed. (Despite the window's name, I didn't see any "Cursor Zones" in this example; the cursor remained in the shape of an arrow within the window.)

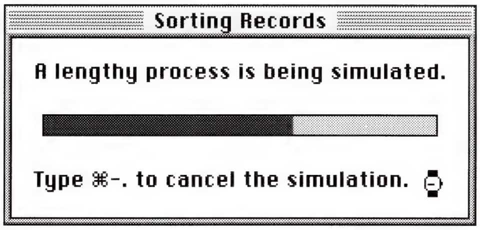
In Figure 5 the watch cursor is animated while the progress indicator ("thermometer") is advancing.



○ .5 MHz.
● 1.0 MHz.
○ 2.0 MHz.

This demo simulates MIDI Interface settings.
Click on an icon to select it.

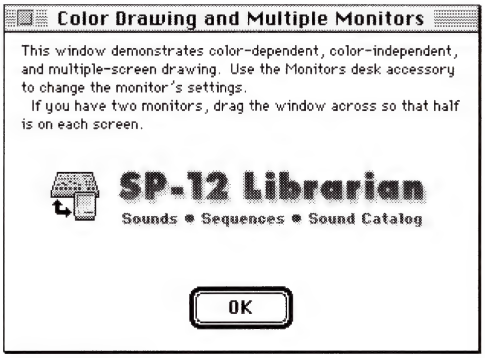
Figure 4. Icon button example



A lengthy process is being simulated.

Type ⌘-. to cancel the simulation.

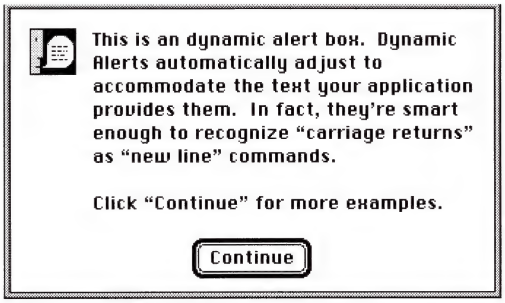
Figure 5. Pretending to sort


Color Drawing and Multiple Monitors
SP-12 Librarian
Sounds • Sequences • Sound Catalog
OK

This window demonstrates color-dependent, color-independent, and multiple-screen drawing. Use the Monitors desk accessory to change the monitor's settings.

If you have two monitors, drag the window across so that half is on each screen.

Figure 6. Color-independent drawing



This is an dynamic alert box. Dynamic Alerts automatically adjust to accommodate the text your application provides them. In fact, they're smart enough to recognize "carriage returns" as "new line" commands.

Click "Continue" for more examples.

Figure 7. Self-sizing alert

Figure 6 illustrates how the Tools Plus library compensates for the color abilities (or lack thereof) of your Macintosh. When the figure is drawn on a monochrome monitor, the picture and accompanying text are drawn so that they are still entirely readable. I didn't have two monitors to demonstrate to myself

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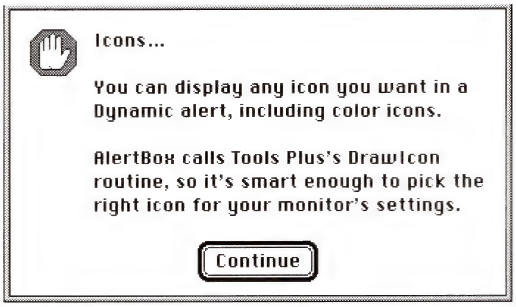
that one-half of the window would be drawn in monochrome and the other in color, but I did change the Monitors control panel settings to verify that the color text and the picture are perfectly readable when using the "Black & White" setting.

The alert shown in Figure 7 illustrates that you can put whatever text you want displayed, including carriage-return characters, and the Tools Plus libraries will create a dialog that's exactly the right width and height to hold that text. (Carriage-return characters are specified as `'\r'` in the text string.)

The alert shown in Figure 8 demonstrates that dynamic alerts can contain any icon you choose, including the System's standard icons. After pressing the Continue button in this alert, you are given the opportunity to see other examples of alerts, even alerts with no associated buttons. Clicking the mouse inside the alert dismisses it.

The Tools Plus libraries include a variety of pop-up menus (Figure 9). These can contain words, icons and words, icons only, what Water's Edge calls "Pop-Down" menus that are used to specify immediate actions to perform, as well as pop-up menus of any size, using any font.

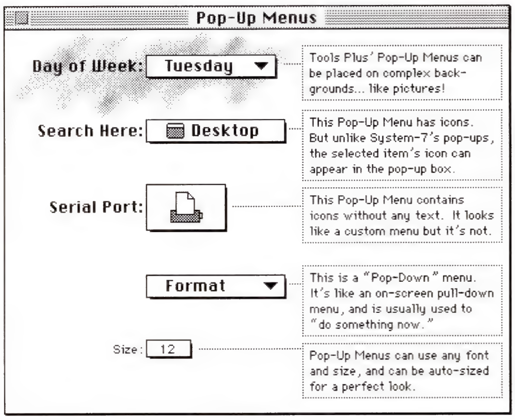


Icons...

You can display any icon you want in a Dynamic alert, including color icons.

AlertBox calls Tools Plus's DrawIcon routine, so it's smart enough to pick the right icon for your monitor's settings.

Figure 8. Self-sizing alert with icon of your choice



Tools Plus' Pop-Up Menus can be placed on complex back-grounds... like pictures!

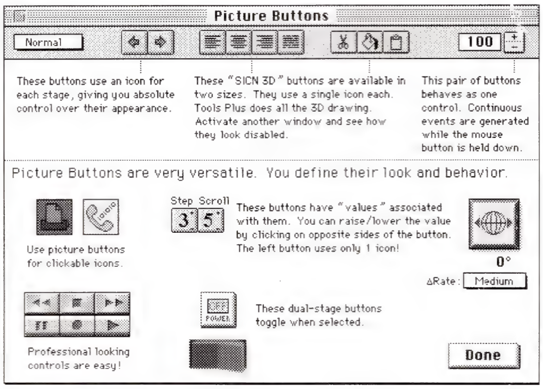
This Pop-Up Menu has icons. But unlike System-7's pop-ups, the selected item's icon can appear in the pop-up box.

This Pop-Up Menu contains icons without any text. It looks like a custom menu but it's not.

This is a "Pop-Down" menu. It's like an on-screen pull-down menu, and is usually used to "do something now."

Pop-Up Menus can use any font and size, and can be auto-sized for a perfect look.

Figure 9. Various pop-up menus



These buttons use an icon for each stage, giving you absolute control over their appearance.

These "SICN 3D" buttons are available in two sizes. They use a single icon each. Tools Plus does all the 3D drawing. Activate another window and see how they look disabled.

This pair of buttons behaves as one control. Continuous events are generated while the mouse button is held down.

Picture Buttons are very versatile. You define their look and behavior.

Use picture buttons for clickable icons.

These buttons have "values" associated with them. You can raise/lower the value by clicking on opposite sides of the button. The left button uses only 1 icon!

These dual-stage buttons toggle when selected.

Professional looking controls are easy!

Figure 10. A plethora of picture pushers

You might think that you've seen it all, but we're just getting to the good stuff. The Tools Plus libraries also contain a

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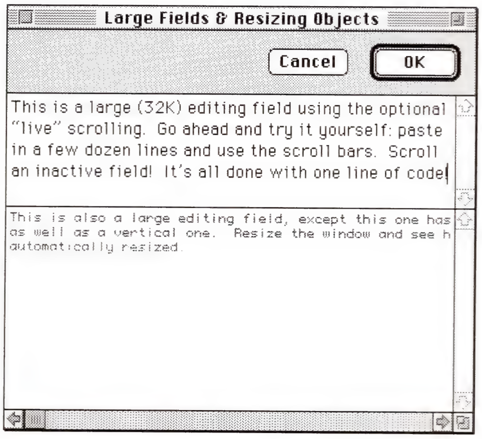
large selection of picture buttons. A number of these are illustrated in Figure 10. (Sorry about the caption for the figure, but I couldn't resist!) The variety of picture buttons available in the Tools Plus libraries is just amazing. Every one of these is created by a single line of code. The 3D buttons in the lower left are examples of CD-ROM controls. The buttons at the top of the window show some of the features of text-editor and drawing programs. The middle set of buttons in the top panel illustrate various text justification styles.

The "Step" and "Scroll" buttons in the middle of the figure illustrate how the values shown on the buttons can be modified by clicking on either the top or bottom of the button. Clicking on or near the plus-symbol or minus-symbol in one of the buttons causes the numerical value in that button to increment or decrement, respectively; plus, the "Step" button changes value each time it is clicked, whereas the "Scroll" button continues to increase or decrease in value as long as the mouse button is held down.

The button at the far right, in the middle of the window, has an associated value whose minimum, initial, and maximum are specified when the button is created. If the button is clicked near its right edge, then the button's value is increased. If the button is clicked near its left edge, then the button's value is decreased. (The display of "0°" below the button is managed separately and, according to the specifications for the "Globe" button, can vary from -179° to +180°.) The button is also specified to have medium acceleration, meaning that the value changes more and more quickly the longer the button is pressed. (An acceleration rate can be specified as slow, medium, or fast.) The "Globe" button is created by a single line of code:

```
NewPictButton( GlobeButton, 410, 153, GlobeIcon,
     picbutRepeatEvents + picbutAutoValueChg +
     picbutScaleMedAccel + picbutValueWrap +
     picbutLeftRightSplit + picbutSelectAltImage +
     picbutDimUsingWhite, enabled, notSelected, -179, 0, 180);
```



This is a large (32K) editing field using the optional "live" scrolling. Go ahead and try it yourself: paste in a few dozen lines and use the scroll bars. Scroll an inactive field! It's all done with one line of code

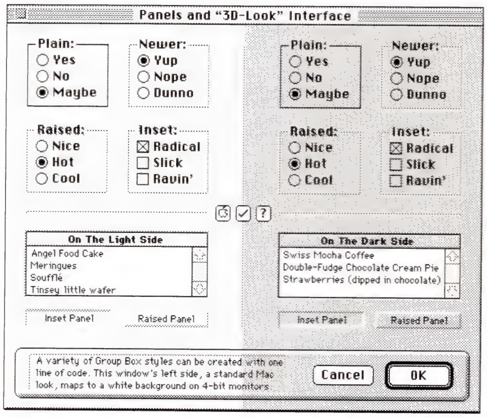
This is also a large editing field, except this one has as well as a vertical one. Resize the window and see h automatically resized.

Figure 11. Large text fields

Most of the style settings here are specified as symbolic names. The button's ID (`GlobeButton`) is a unique value that identifies the button whenever it is referenced. The Demo program defines the `GlobeButton` symbol as the value 16. The icon for the button can be anything you want and is indicated by the `GlobeIcon` symbol, which is defined to refer to a `'cicn'` resource of 460. The 410 and 153 values refer to the left and top positions of the button, and the numeric values in the last three arguments refer to the minimum, initial, and maximum values that the button can contain.

Figure 10 also shows an ON/OFF button whose caption changes whether it is on or off and also a toggle-switch which changes its appearance depending upon whether it is clicked to the left or right. It's safe to say that the figure illustrates only a few of the multitude of picture button possibilities.

Some applications require text fields that exceed the standard 255 character-width provided by Str255 variables. The Tools Plus libraries provide text fields that are up to 32K characters in width. These are illustrated by Figure 11. You can display panes that contain quite large text fields. The lower pane in the figure illustrates a field that has both vertical and horizontal scroll bars. Each of the text panes has its own font, size, style, color, and justification. The horizontal scroll bar can occupy the entire width of the window, or it can be offset by any multiple of fifteen pixels, from 15 to 225. The offset is from the left edge of the window. There are so many options with each of these elements that it's impossible to list all of the features here.



Angel Food Cake
Meringues
Soufflé
Tinsey little wafer

Swiss Mocha Coffee
Double-Fudge Chocolate Cream Pie
Strawberries (dipped in chocolate)

A variety of Group Box styles can be created with one line of code. This window's left side, a standard Mac look, maps to a white background on 4-bit monitors.

Figure 12. Panels and a 3D look

Water's Edge saved the best window for last in its Demo menu; it shows how 3D panels can be used to spruce up your user interface (Figure 12). I like the raised and inset panels best. This figure shows how button groups and lists with a variety of appearances can be created easily by using the Tools Plus libraries. Once again, each of the elements in the figure was created with a single statement in the Demo program's source code; this is clear testimony to the power of the libraries.

There are more features shown in the Demo program than are pictured here. Tools Plus provides floating palettes that are oriented either horizontally or vertically, and also tool bars that nestle directly under the menu bar in your application. All in all, it's an incredibly rich collection of tools.

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The product comes with a 392-page printed spiral-bound manual. It's comprehensive and well written, and includes prototypes (in both C and Pascal) for calling the functions, plus examples and tips. It's really good. And you also have the source code for the Demo application to compare against the manual's explanations. Water's Edge also provides source code tutorial samples illustrating how to create a "Hello World" application, plus buttons and panels, list boxes, editing fields, pop-up menus, picture buttons, tool bars and floating palettes, and so on. Each tutorial project is simple enough that the relevant features are all in one place.

SUPERCDEFS TOO!

Water's Edge also offers a set of custom CDEFs (control definition resources) called SuperCDEFs, implementing many of the custom features of the Tools Plus libraries. As stated earlier, this product is available separately or with the purchase of a Tools Plus Development Kit for any of the listed development environments (not with an academic discount). To paraphrase the *SuperCDEFs User's Manual*, it consists of a collection of high-quality contemporary controls, designed and implemented by professional Macintosh developers to be as reliable as Apple's controls, and just as easy to use. The SuperCDEFs offer a range of styles, from subtle improvements over Apple's own to a bold 3D appearance.

The CDEFs are arranged in categories encompassing buttons, tabs, sliders, and thermometer controls. 68K, native PPC, and fat versions of the controls are offered. The SuperCDEFs product comes with a comprehensive online user's manual. I didn't have a chance to test the CDEFs.

OK, THEY DID IT, BUT CAN I?

I think the answer to this question is: Maybe. It all depends on how much effort you are willing to put into learning the Tools Plus library functions.

One thing you'll have to get used to is that the Tools Plus libraries provide a higher-level event loop called `PollSystem` that returns the current event in a special `Poll` structure. This lets the loop identify directly the element for which the event is destined, rather than requiring you to deal with mouse coordinates, "control parts," or the like. The Tools Plus manual provides only one example of the main event loop, but it is in Pascal, rather than in both C and Pascal. Water's Edge didn't also provide a single library function to initialize the various toolbox managers, so you will have to start your application with the usual toolbox initialization calls. You also have to initialize the Tools Plus components with a call to `InitToolsPlus`. None of this is hard.

More important, there is no graphical interface for designing the interface. You have to design on graph paper, estimating coordinate values for the various elements – because, instead of using resources to describe the various controls, Water's Edge requires that you include coordinates and sizes inside the function calls. This also has implications for "tweaking" the interface as the program design progresses – this involves modifying the code and not just the parameters of a resource.

The folks at Water's Edge are aware of all this, and are currently working on a project code-named "Anthem" that will offer a MacDraw-like user interface design capability, and then generate source code targeted directly at the Tools Plus library function call interfaces. If this sounds like another AppMaker or Visual Architect tool to you, Water's Edge is quick to point out that their objective is to reduce the complexity and volume of source code in a project, and this includes source code in a class library or code generated by an application builder. We'll have to wait until the end of 1996 to see what Water's Edge has in store for us in this regard.

In the meantime, if you are interested in developing applications that have "quality" written all over them, then Tools Plus is for you. It will take some time to get used to writing functions rather than using resources, but the result will be worth the effort. I tested both the CodeWarrior and Symantec versions of the product and found each of them to work perfectly. If I wasn't hard at work on another book project at this time, I'd be very tempted to write a program using the Tools Plus product.

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FROM THE FACTORY FLOOR

By Dave Mark

A Little CodeWarrior History

This month, we're going to talk with John McEnerney, one of the compiler writers at Metrowerks.

Dave: How did you first hook up with Metrowerks?

John: I first met Greg Galanos when I was the development manager at Symantec's Language Products Group. Greg was trying to get me interested in doing some sort of deal with the fledgling Metrowerks, and I mostly ignored him because they were trying to compete aggressively with my first product, THINK Pascal. I would have never guessed that a few years later he would offer me the best opportunity of my career.

Dave: When did you leave Symantec?

John: I left Symantec in October '92, taking about 6 months off to figure out what I wanted to do next. I didn't have any real plans, but I figured I'd find some way to do PowerPC work. I didn't relish the thought of trying to write an entire C++ compiler, so I considered doing a Pascal product on my own.

Around this time, Greg had heard from Rich Siegel (of BBEdit fame) that I was no longer at Symantec, and he called me right away. The first thing he said to me was, "describe your dream job," and I told him I wanted to write a PowerPC code generator for the upcoming Power Macintoshes. I flew to Montreal to meet him and his partner, Jean Belanger. We had some Italian food, drank some wine, and they told me a little about their Pascal and Modula products. I was really hot to write a PowerPC backend, but I was not that impressed with their technology. We talked about various contracts, but I didn't have a really solid feeling yet.

Dave: What finally convinced you to go with Metrowerks?

John: In February '93, Greg asked me to meet with him in Palo Alto to get a look at a C compiler that they had just acquired; a guy named Andreas Hommel in Hamburg had been writing it as a hobby. It ran on the Macintosh, had a simple but nice IDE reminiscent of early versions of THINK C, and it was fast. I spent about an hour looking through the source code: it was well organized, the compiler front-end and back-end were cleanly separated, the code was easy to follow, and in addition to being a full ANSI C compiler, it had a lot of the C++ language implemented already.

It was clear that Greg had found a diamond in the rough, the perfect platform for a native PowerMacintosh product. A few hours later we had a contract – I had about 6–8 months to write a PowerPC back-end and linker. Andreas would finish the C++ language implementation, and a few guys in Montreal (Berardino Baratta, Marcel Achim) would work on the IDE and a new Pascal front-end. We immediately hired Greg Dow, who had written the THINK Class Library for Symantec when I was there, to write a new application framework: PowerPlant.

John McEnerney has been writing Macintosh development tools for the past 11 years, first at THINK Technologies / Symantec Corporation, and then at Metrowerks. He was the creator of THINK Pascal, the first Macintosh compiler with source-level debugging, and one of the designers of the THINK C compiler and environment. He is currently the PowerPC compiler and linker architect at Metrowerks.

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We must have hooked up with Jordan Mattson from Apple around this time, because a week or so later he sent me one of their RS/6000s to help me get started. Between him and Alan Lillich, who I had met at all the early PowerPC meetings that Apple had been holding for their key developers, I got pretty much everything I needed from Apple.

So, I now had a contract to do the most interesting work I could imagine; all I had to do was figure out where to start.

Dave: What was it like working with Andreas' compiler?

John: Andreas' compiler was pretty traditional in its organization. The front-end made a single pass over the source code, performing lexical analysis as it went, and generated an intermediate representation (IR) that consisted of expression trees, labels, and branches. It took about a week to totally remove the 68K code generator from the rest of the compiler, and put in stub routines where the front-end and the back-end connected so that everything would still link. If I could fill in all the stub routines in exactly the right way, we'd have a PowerPC compiler.

The first thing I did was write a routine that dumped the IR in human-readable form – I don't know how Andreas got his 68K code generator to work without that, I guess he can keep more in his head than I can. Looking at the expression trees on the screen allowed me to visualize how the code generator would proceed.

Most CISC compilers spend a lot of time working on the IR trees themselves. Traditional global optimizations like loop-invariant code motion or common subexpression elimination are performed by rewriting the IR trees into optimized IR trees. The code generator gathers information about the shape of the trees, deciding how many registers will be needed, which addressing modes will be used, etc. After instructions are generated they are largely ignored except for small "peephole" optimizations. (A notable exception to this is the gcc compiler, which transforms the expressions into a simple algebraic representation called RTL and uses repeated "peephole" optimizations derived from a machine description to coalesce these RTL expressions into complex instructions and addressing modes.)

Most of the RISC compilers that I'd read about in the compiler literature used a different approach: immediately transform the IR trees into a low-level representation that was similar or identical to the actual RISC instructions of the target machine, and perform all optimizations at the machine instruction level. I decided to use this technique in my PowerPC code generator.

Dave: What was your basic approach to code generation?

John: Strange as it may seem, the first part of the code generator I actually wrote was the instruction scheduler – the phase that reorders instructions to minimize latencies caused by load delays, and to permit floating-point and integer instructions to execute in parallel. I needed to know if my low-level representation – I called it a "pcode" (no relation to the UCSD Pascal pcode) – had enough information for all the phases I would eventually write, and since the scheduler needed a lot of information, it would serve to prove the design of the pcode. Of course, I had to rewrite the scheduler twice more: the first time was to fix the original one, which had some design flaws, and the second time was to make it more general to support 601, 603 and 604 CPUs.

Once I finished the scheduler, I had my data structures organized and all the support routines in place, so I started writing the instruction selection phase – the "guts" of the code generator. This phase visits the IR tree and generates pcode. It does try to recognize certain tree patterns, like opportunities for FMADD and FMSUB routines, but since there are no complex addressing modes and very few complex instructions, it is mostly a straightforward translation to PowerPC instructions.

To get short-term results, I wrote a quick-and-dirty register allocator, and some code to display the generated pcode instructions, and was able to get most of the code generation debugged this way. I decided to use a proprietary object code format, derived from the one we were already using in our 68K compiler and linker, since I could get this working faster than trying to write an XCOFF linker. I spent a few weeks getting the linker working, finished the part of the code generator that wrote the object file, and I could actually compile and link small programs.

Dave: How did the debugger fit into all this?

John: Around August '93 the project was falling into place, but we still didn't have a source-level debugger. In a most serendipitous event, Dan Podwall, a friend of mine from Symantec, called and asked whether there were any opportunities at Metrowerks. Greg Galanos called him right away, hired him on the phone, and 4 weeks later he had written a debugger – in PowerPlant, no less – that could single-step and set breakpoints. This would be the first commercial PowerPlant program – in fact, the first PowerPlant program of any kind aside from Greg Dow's demos.

Dave: How did you build the compiler?

John: By September '93 we had some prototype PowerPC hardware, and I had a working code generator and linker

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which ran on the 68K Macintosh and generated PEF executables that ran on the prototypes. Since this compiler was already built using our own 68K compiler, it was pretty easy to rehost it on the Power Macintosh: we made the changes for the Universal Headers and routine descriptors and such, then compiled it with itself on the 68K machine, which gave us (after some debugging!) a working PowerPC-hosted PowerPC compiler. With a little bit of trickery, mandated by differences between PowerPC floating-point hardware and the 68K SANE software floating-point architecture, we were able to rehost the 68K compiler on the Power Macintosh as well. We now had the fastest compilers on the Macintosh.

Dave: What next?

John: I still had a lot of work to do on the PowerPC code generator. The biggest task was to replace the quick-and-dirty register allocator with a graph coloring–based allocator. This is one of the great algorithms in the history of compilers. For years people had been trying to come up with an accurate way to represent the lifetimes of variables, so that variables or temporaries that did not overlap could share a register. A lot of *ad hoc* techniques were developed, but this guy from IBM Watson Research Center named Greg Chaitin discovered a formal approach that solved the problem better than anything that had been previously attempted: build an "interference graph" which has an edge between any two variables whose values may be live at the same time, and then try to color this graph with N colors where N is the number of available registers.

So my code generator assumes it has an infinite number of "virtual" registers, and generates the most efficient code it can under that assumption; for example, it assumes that all local variables, arguments, and TOC pointers can be assigned to a register. After the code is all generated, the register allocator tries to rewrite the virtual registers using real PowerPC registers, and generates extra code to "spill" values that couldn't get a real register. In most cases, everything gets a register since there are so many on the PowerPC. The smarter register allocator probably makes the overall largest contribution to code quality.

The algorithm has one drawback: it has O(N^2) complexity. There are actually programs which have so many intermediate expressions that the interference graph gets too large and it takes several minutes to color it. So I had to keep around the quick-and-dirty allocator as well, which is why you'll sometimes get an annoying message that says the code generator ran out of registers if you're compiling without global optimizations.

Dave: And so, CodeWarrior was born!

John: By December I had pretty much everything working. After a last-minute dash to get C++ language support working on the PowerPC, we were able to burn our first public release, DR/1, starting a long Metrowerks tradition of getting things in under the wire and never missing a ship date. We introduced the product at the San Francisco Macworld Expo with our huge 8-page *MacWeek* advertisement, and CodeWarrior™ was born.

There were plenty of things to be cleaned up between DR/1 and DR/3, which was our real "1.0" release. But by shipping DR/1 and DR/2 when we did, and by working closely with a lot of the major Macintosh software vendors, we were able to help a lot of companies get their software ported to the PowerMac that otherwise might not have.

For me, I had accomplished what I had wanted to when I was back at Symantec: building the PowerPC compiler that most users would use to port their code to the new Power Macintoshes. And Greg had kept his promise and given me my dream job.

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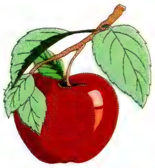

By Don Crabb

Too Many Cups of Java

In less than a year, Sun Microsystems' Java WWW programming language has gone from "What's that?" to "It will change your life." Companies have been falling all over each other trying to figure out what Java is, how to use it, how to exploit it, how to build products with it. The action's been hot in both the Windows world and in Mac OS land. My question is this: where does the hype end and the reality begin?

For Mac language vendors, the answer is obvious: the reality is that they must have their own version of Java to feed the Mac development community and keep those developers in line with their mainstream C/C++ environments. Besides the problematic SunSoft Java WorkShop 1.0 (problematic for Mac developers, that is, because it runs only on Solaris 2.4 [or later], Microsoft Windows95, and Windows NT 3.51 [or later]), this has already given rise to Natural Intelligence's Roaster, Symantec's Café, and Metrowerks' CodeWarrior Java (thank you, Metrowerks, for not choosing a cutesy name!), and others that will certainly make their presence felt in 1996 – including, maybe, an Apple Java as part of a forthcoming ETO release.

And, as popular as Java-for-the-Mac releases have become, books that purport to teach you Java or some aspect of Java programming have proliferated at an astounding rate. You can walk into any decent bookstore these days and find a Java Programming section all to itself. (By the way, if you are looking for top-quality Java books, consider those published by O'Reilly Books; they're the top titles.)

I don't have a quarrel with the book publishers or tool vendors; it is their job, after all, to provide us with the means to an end. It's the end that I'm not all that clear on.

What, really, is Java going to do for the moribund Macintosh market? Will it give us the means to create insanely great applications that we couldn't create without it? Will it create new markets for our products that did not exist before? Will it convince customers to buy Macs instead of Wintel? Or will it do none of these things?

CREATING JAVA APPLETS

The creation of Java applets has consumed much of the WWW content work for many professional Web publishers for the last six months. And with the availability of Netscape Navigator 2.X for the Mac, Mac folk have a browser that can actually use these applets as they were meant. But has that capability really helped the Mac?

I don't think so. The reason is simple: given the very shaky state of Apple these days, anything that does not contribute to the corporate bottom line (and thus, indirectly, to our individual bottom lines) is a waste of time and money. So far, the general availability of Java on the Mac has not contributed a dime in direct Mac sales. It's made money for tool vendors and book publishers, but it's not made a dent in Apple's financial woes. And it's not likely to make much of a dent, either, unless Apple can figure a way to stake out some aspect of Java that is uniquely Mac (even if it takes marketing conceits to do it).

Don Crabb is a contributing editor and columnist for *MacTech Magazine, MacWEEK, MacUSER, MacHome Journal,* IDG's *Crustacean-At-Large, MacToday, Win95User, ComputerUser, The Chicago Sun-Times Features Syndicate, The Springfield Union-News, PC Magazine,* and about a million other publications. Don welcomes comments at his Internet address: decc@cs.uchicago.edu. You can also check out his WWW home page at http://www.cs.uchicago.edu/~decc/.

So far, that has not happened, and Apple has no announced plans to remedy it. Java has not yet been componentized by Apple to fit its OpenDoc SOM architecture. It has not yet been incorporated into any scheme with Cyberdog. Apple hasn't even mentioned it in the same breath as Copland. Given the latter's continued story of delay, you might think that, if Apple figured Java would be a big part of their Internet strategy, they would announce that Java support would be built into Copland. Even lip service on this issue would be welcomed.

So far, Apple's only told us that it will incorporate Java into the Mac OS, Newton and other technologies. Chief Scientist Larry Tesler said at the recent Internet World conference that the company would make Java "widely available in its products", such as: the Mac OS; Cyberdog, the company's suite of Internet OpenDoc parts; its Internet servers; the Newton OS; and Apple's "media-authoring technologies". But exactly what that means (will it be the full componentization that's needed?) is quite unclear, as are its Mac OS plans.

CREATING NEW MARKETS

I have no doubts that Java will somehow create new markets, just as the Internet and WWW are doing in a more global sense. What I have great doubts about, however, is how any of these emerging markets will help out Apple, the Mac OS, and Macintosh. Given that the current number-one Web browser (Netscape) has become an afterthought on the Mac, and that other WWW publishing, management, and content-creation tools are never going to see Mac versions, the prognosis for Java on the Mac is not swimmingly positive – especially at doing anything to help create new markets for Mac.

This could change given the right moves by Apple, by an Apple-Sun-Netscape merger or technology agreement, or because of increased pressure by Microsoft forcing their foes together to rally around Java as an anti-Microsoft WWW discriminator.

In their order above, I'd rate those possibilties as moderately likely, moderately unlikely, and nearly impossible.

SLIPPING CUSTOMERS THE CONVINCER

Well, this category is pretty much a no-brainer. Java already runs in many forms on Windows platforms (remember, even the SunSoft Java WorkShop 1.0 runs on Windows95 and NT, but not the MacOS). In fact, it's led the way over Mac implementations of the language and over Java-enabled applications on the Mac. So as a Mac vs. Wintel differentiater, Java ain't it.

But that does not mean that Apple could not (with a hell of a lot of development and marketing work, and maybe a partnership or two) produce a compelling Java-on-the-Mac strategy that *would* be an inducement to go Mac – especially if that strategy revolved around Apple as the vendor of choice for the intranet. Given the Mac OS-based client/server products that already play nice on the Web (good stuff like 4th Dimension, Tango/Butler, and others), Apple could make a Java-based intranet strategy fly. But it would mean serious support for existing tools vendors and a serious commitment to developing real Java-based intranet solutions for MacOS customers.

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CRABB'S BOTTOM LINE

The question I asked at the top of this column, "What, really, is Java going to do for the moribund Macintosh market?", still remains unanswered. And after slicing and dicing that question into its components, I find the answer just as elusive.

The reason is because the one unknown in all of this is also the most important player – Apple. As I am writing this, Apple still has yet to articulate an Internet strategy. Supposedly CEO Gil Amelio will have told us what that is at WWDC '96 in May. But unless that strategy is a pretty darn bold one that includes some serious commitments (that means people, time, and *real money*) towards redefining Java as an Apple-centric technology driving Apple-branded solutions, I don't think Java's going to mean all that much to Mac developers.

I fervently hope I am wrong, however, and that Apple does try to gain control of the Java bandwagon to meet its and its developers' needs. To date, however, that effort has been pathetic, in the extreme.

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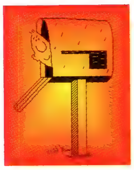

By Matt Neuburg, letters@mactech.com

JAVA WITHOUT THE HYPE

Introduction

Talking to my colleagues about Java, I find as many skeptics as enthusiasts. Both sides generally are reacting to the hype, the one rejecting it, the other accepting it. But there are reasons to praise and disparage Java without regard to that hype – that is, without regard to its use on the Internet.

Such a critique is possible because Java is designed to (among other things) support the development of stand-alone, cross-platform applications. So the question at hand really is, "How good is Java as a general-purpose language, and how good is its implementation?"

Java Implementation

As it happens, the rough spots in Java are due mainly to its implementation, which is correctable, not to its language features. The Java libraries are incomplete. I could not, for example, mimic a simple FaceSpan-built interface in Java; it seems not to distinguish checkboxes and radio buttons. The libraries are buggy; list boxes would not reshape or draw correctly, for example. More important, there is no visual interface builder (yet); interfaces have to be created "inside out" – that is, starting with text, as during the Neolithic Age. FaceSpan, Visual Basic, Delphi and others have shown that there should be visual interface builders for a language from day one.

It is also shocking to see the sloppy, unannotated, even unformatted "example" applets made public in the developer's kit.

But implementation problems are correctable; they are significant only until they are fixed. The more important aspects of a language are its feature set and the development methodology that it supports. This is the side of a language that is cast in concrete, and that can make it usable immediately and for the long term – or not. Now the question is, "Does Java represent progress in language design?"

A Little History

Program language design has made great progress during its 50-year history, albeit in steps both forward and backward. Real-life usage constantly suggests or demands new features and, when "enough" demand has accumulated, some brave soul abandons the current languages to design another that addresses at least some of the demands.

The demands upon languages are both concrete and abstract. Concrete demands relate to things like control constructs, data types and fine points of syntax and semantics. More abstract demands are those in support of certain methodologies; these, of course, lead to concrete demands, such as demand for a syntax that supports data abstraction.

It is fairly easy to see the major trends in language design, and to see the progressive and regressive language features. Here are some of the major trends:

- Movement toward "higher-level" control constructs, those that do more in fewer instructions. From assembly-language looping constructs, we moved to the FORTRAN "for" loop, and to the implicit loops of APL or the removal of loops by way of recursion.

- Simplification and reduction, the factoring out of necessary and sufficient features from the current feature experiments. In PL/I, we could loop n times, forward or backward; or loop over any arbitrary list of numbers; or over any combination of forward, backward and arbitrary; and do this "while" or "until" some other condition is true. Pascal reduced this to the simplest "for", "repeat" and "while" loops.

- Putting features into libraries instead of into the language itself. PL/I is a huge language; every conceivable feature (at the time) was put into it. C, on the other hand, is a small core language with large standard libraries.

- Strong typing, which is the detection at compile time of errors that would otherwise occur at run time. Familiar examples of this concern type-checking in expressions and in parameter lists. In FORTRAN and C, actual and formal parameters need not match; in Pascal and Ada, they must match or the program will not compile.

- Information hiding in all its forms, including encapsulation, data abstraction and objects. Opportunities for information hiding within a COBOL program are non-existent; it is very much better in Pascal; and it is key to Object Pascal and C++, both of which support objects.

There was much more in this historical mix – recursion, functional programming, orthogonality, regularity, parameter-passing protocols, and many advances in the implementation of these features – but I think I have highlighted the major ones.

Progress and Regression

The hundreds of languages that have sprung up in the last 50 years, including the dozen that have seen widespread adoption, were not always progressively better, although most fit the moods in which they were designed.

Pascal was progressive because it was a simplification, because it demonstrated the benefits of strong typing, and because it was designed for fast, single-pass compilation. But it was too simple for real-world development until it had good supporting libraries.

C was progressive because it, too, was a simplification, and because it defined a set of libraries as "standard" extensions of the language. But C was also regressive with respect to its arcane declaration syntax, the weakest typing since assembly language, and its exclusion of strings as a native type.

Object Pascal and C++ were progressive because they catenated objects onto compiled languages already in widespread use, but Object Pascal now suffers "socially" from being based upon an abandoned language, while C++ suffers technically from being based upon C.

Java's Place in History

And now Java: How does Java fit into the evolution of languages? It is progressive in several ways, some of which are:

- It is a simplification (but not an over-simplification) of C++, the most popular object-oriented language.
- It reasserts the necessity of strong typing.
- It brings strings back into the language (and makes arrays first-class citizens).
- It provides high-level program-structuring features – packages and interfaces.
- Objects are central to its design; they are not just an add-on or an "orientation".

Java does perpetuate some irritating features of C and C++. For example, it uses the prefix notation for declarations, whereby you sometimes must read a half-dozen qualifiers before you can find an object's name. But, minor irritants aside, Java is a real advance in language design.

This does not mean, of course, that everyone will like its features or even use them to greatest advantage. C hackers (not all C programmers) who now willingly pass along the costs of weak typing and wild-card pointers to their customers will be irritated that there is no switch to turn off responsible programming. And I have already seen a published binary-tree example that simply ignores the object features to implement the tree in a completely "traditional" way. But programming has always included ego, habit, ignorance, self-indulgence and resistance to change, alongside common sense, experimentation, experience, responsibility and progress. Good languages tend to support the good programming traits, but they cannot always suppress the bad.

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Summary

Even if we disregard the self-serving hype of all who hope to profit financially from the spread of Java (and especially if we disregard the ignorant parroting of the popular press and the "new world order" freaks), we find that Java is an important step in the evolution of programming languages, a step we all need to take.

Postscript

Let me make a proposal concerning Java: programmers should hijack it.

Java is an important new tool; we must not accept the idea that it is just for the Internet, or just for "applets", or just for cross-platform development, or that it is just Sun's language. Schools should start teaching it in introductory courses; we should create a demand for good compilers (even if machine-specific) and good development environments; and we should pressure Java's authors and promoters into making the standard libraries correct, comprehensive and truly cross-platform as soon as possible.

– David "Uncle Dave" Moffat, Senior Engineer at SDU
uncle.dave@sdu.com

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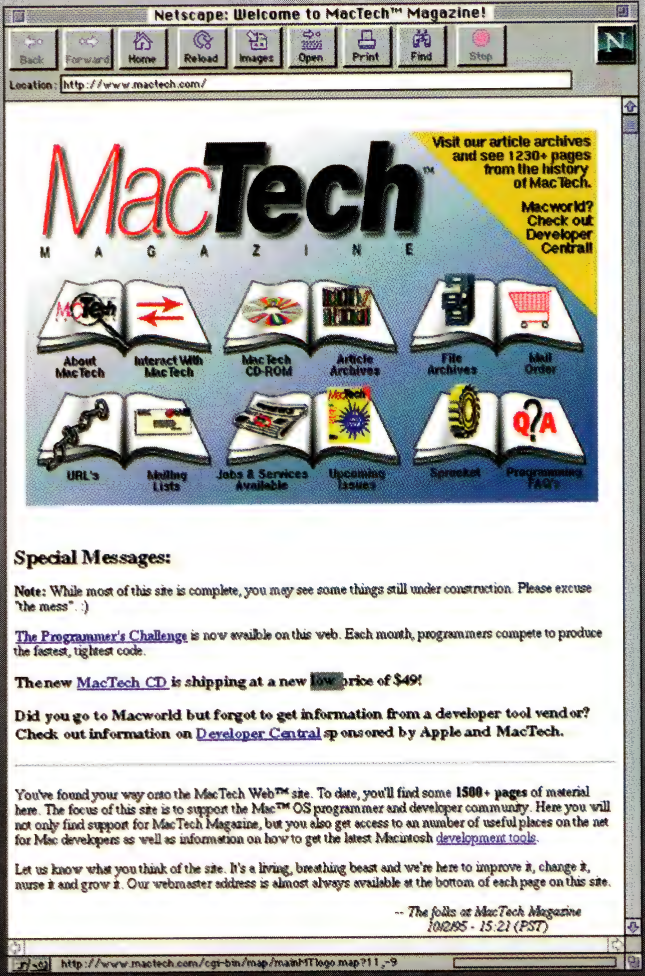
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Special Messages:

Note: While most of this site is complete, you may see some things still under construction. Please excuse "the mess". :)

The Programmer's Challenge is now availble on this web. Each month, programmers compete to produce the fastest, tightest code.

The new MacTech CD is shipping at a new low price of $49!

Did you go to Macworld but forgot to get information from a developer tool vendor? Check out information on Developer Central sponsored by Apple and MacTech.

You've found your way onto the MacTech Web™ site. To date, you'll find some **1500+ pages** of material here. The focus of this site is to support the Mac™ OS programmer and developer community. Here you will not only find support for MacTech Magazine, but you also get access to an number of useful places on the net for Mac developers as well as information on how to get the latest Macintosh development tools.

Let us know what you think of the site. It's a living, breathing beast and we're here to improve it, change it, nurse it and grow it. Our webmaster address is almost always available at the bottom of each page on this site.

-- The folks at MacTech Magazine
10/2/95 - 15:21 (PST)

(Need we say more?)

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Here at *MacTech Magazine*, we rely heavily on outside writers for most of the material that appears in our pages. If readers did not participate in the magazine, sending us their ideas and taking the time to write articles, there would be no *MacTech*. *MacTech Magazine* is not a staff of writers sending a constant stream of one-way messages outwards; it's a living, evolving network of readers conversing with one another, educating one another, sharing their knowledge, their experience, their interest, their trials and tribulations and joys and successes in the constantly unfolding story of programming the Macintosh. *MacTech Magazine* doesn't just happen: it's what the community makes it. If we carry reports of future trends and technologies, if we teach useful methods, if we review new books and tools, if we provoke thought, provide help, ride the wave of current interests and concerns, it is only because we reflect the thoughts of our readers, who speak through our pages.

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Write to me, Matt Neuburg, at editor@mactech.com (or one of the other editorial addresses listed on page 2 of the magazine). Take the future of *MacTech Magazine* into your own hands!

For Macintosh Programmers & Developers
MacTech™
MAGAZINE

NEWSBITS

By John Kawakami

MacTech launches MacDev-1

Westlake Village, CA – May 11, 1996 – Xplain Corporation, publisher of *MacTech™ Magazine*, is proud to announce the launch of MacDev-1™, a new mailing list aimed squarely at the Mac OS Developer Community.

MacDev-1 is a news and information mailing list with a focused charter. Sponsored by *MacTech Magazine* and Developer Depot™, MacDev-1 will be the source of news, information, and occasional special offers specifically for the Mac OS programmer and developer community.

The charter of the MacDev-1 list is to make Mac OS developers more aware of available resources, and to provide an efficient channel through which Mac development tools vendors can spread the word about new product releases. To further this charter, the list is open to press, developers, industry figures, and the general public.

The list will be moderated by *MacTech Magazine*, through a newly appointed Contributing Editor for MacDev-1 – Rich Siegel, the founder, president and CEO of Bare Bones Software, Inc. "MacDev-1 is a natural extension of *MacTech Magazine*'s 'Newsbits' column," said Siegel. "However, readers of the list will hear about the news as it happens. As moderators, our goal is to manage the list traffic, so that subscribers aren't overwhelmed."

Users can subscribe to MacDev-1 by sending mail to macjordomo@listmail.xplain.com with "sub MacDev-1 yourname" in the body of the message. To a submit a posting to MacDev-1, send mail to MacDev-1@listmail.xplain.com.

MacTech Magazine	http://www.mactech.com/
Developer Depot	http://www.devdepot.com/

Apple Looses Flock of Press Releases

Just as the swallows return to Capistrano each year, Apple performed its annual broadcast of the Press Releases during WWDC. This year, over twenty were sent out, and they are all available on the Web. This writer has pored over the text and summarized the interesting news below.

Apple Directions
http://dev.info.apple.com/appledirections/adtoc.html

Apple Propaganda, Straight From the Source

Apple announced plans to expand the company's Web sites, webcasts, and community building activities on the Internet. A new group, Apple Internet Studios and Productions, will manage and coordinate much of the company's Internet presence, which will include not only Apple-specific information, but also general interest content.

Two new Apple-oriented Web sites were announced. The Gil Amelio Homepage – titled "Listen, Learn, & Lead" – outlines Amelio's first-person view of Apple during his first three months at the company, and his strategies for the company's revitalization.

The second site, called "The Plan", outlines the specifics of Apple's recovery plan. People may participate in discussion boards and chats with Apple executives and industry leaders about Apple's developing strategy.

Apple is also doing projects with companies outside the computer industry, including recent promotions for Mission Impossible, and planned webcasts of 1996 Olympic activities.

Gil Amelio Home	http://www.apple.com/leadership/
The Plan	http://ThePlan.apple.com/

Copland is Now Mac OS 8

Apple finally made it official at WWDC; Copland is now known as Mac OS 8. That's "Mac", not "Macintosh", followed by a space, then "OS" and a space, and the number "8". It's not "System 8", and it's not "Copland".

Developer U, Blaze, Debut System 7.5 Course Online

Apple's Developer University is publishing a course produced with a third-party developer. Apple worked with Malcolm Teas of Blaze Technologies, a longtime Macintosh developer, and good explainer.

The printed version of the course can also be ordered from the Developer Tools Catalog.

http://dev.info.apple.com/du/7.5online/7.5TopicsText/ST01-7.5Intro.html

QuickTime VR 2.0 Features New API

Apple has shipped the first developer release of the new programmer's API, and will host developers at a "kitchen" to teach about and get feedback on the new API. Using the API, developers will be able to:

- Display and manipulate panoramas and objects
- Combine still images into panoramas
- Turn QuickTime movies into panoramas
- Combine QuickDraw 3D objects into panoramas
- Incorporate directional sound and speech input
- Incorporate specialized transition behavior between panoramas
- Override QuickTime VR's default behavior relative to event handling, cursors, and hot spots
- Incorporate specialized hot spot information unique to the application
- Manipulate QuickTime VR memory usage

2.0 will also feature "hot spots", or regions where the user may click to follow a URL. QuickTime VR objects will now have zoom and translation capabilities, and also have hot spots. Overall, navigation and interactivity has been improved, and greater integration with QuickDraw 3D is being achieved.

QuickTime VR	http://qtvr.quicktime.apple.com

Apple Lets CyberDog Out, Also OpenDoc DR 5

Bound into this issue of MacTech Magazine are CD ROMs for CyberDog and OpenDoc. As you have probably guessed, these are brand new releases. Have fun!

WEBEDGE IV, SEPTEMBER 16 – 18, 1996, AUSTIN

WebEdge, the conference for Macintosh Web developers, September 16–18, 1996 at Austin's Renaissance Hotel. Topics include: Java for WebMasters, Java Developer Environment, Security, Multimedia tools, introductory and advanced CGI training, advanced HTML and page layout, Databases, Future Technologies, Site Administration Tools and more. The event kicks off with a reception on the 15th. The registration fee for the conference is US $795 if received by June 15, 1996. Thereafter, the fee is $895.

WebEdge • (512) 349-0503

WebEdge	http://www.webedge.com

APPLE AND NATURAL INTELLIGENCE TEAM UP TO BRING JAVA TO THE MAC OS

Apple has committed to supporting Java in the Mac OS, Newton, and Pippin. Apple expects to incorporate Java into its media authoring technologies, Internet servers, and client software, including CyberDog.

To compensate for their limited experience with Java, Apple has licensed Natural Intelligence's Roaster virtual machine, just-in-time compiler, and other technologies for use in Mac OS. Roaster's virtual machine runs Java code, and is distinguished from Sun's original Java virtual machine by its defined API and perfect garbage collection.

Natural Intelligence • (617) 876-7680
Email: info@natural.com

Natural Intelligence	http://www.natural.com/

EVERYWARE'S BUTLER NOW SUPPORTS ODBC, EVERYWARE & NATURAL INTELLIGENCE WORK ON JDBC, TANGO SUPPORTS FILEMAKER

Butler 2.0

Everyware announced that Butler 2.0 now supports ODBC with TCP/IP. With TCP/IP support, Butler now can be accessed by heterogenous clients over the Internet. New enhancements include support for the Alter Table statements, ODBC AppleScript extensions, and support for default ODBC and DAL stored procedures. Included with Butler are the ButlerLink connectivity tools that help developers use Butler as a database back end with C, C++, FirstClass, AppleScript and other OSA languages, and HyperCard via an XCMD. Also included will be a single license for Clear:Access, a visual query and reporting environment that assists end-users with its quick data retrieval and easy-to-use professional report generation capabilities.

Natural Intelligence, Everyware

Everyware and Natural Intelligence announced that they are now working together to create new Java classes to use ODBC over the Internet. They will support the full Java Database Connectivity (JDBC) standard, which allows for Java applications to use ODBC.

Tango With FileMaker

Everyware's Tango is a visual tool for Web developers used to create HTML forms which query databases. Tango started as a tool that generated SQL queries and required an SQL database as the back end. Due to popular demand, Tango now supports interaction with FileMaker Pro databases as well. Web developers can take advantage of FileMaker's rapid application development cycle, and deploy web databases even faster than before.

Everyware Development • (888) 819-2500
Email: sales@everyware.com

Everyware	http://www.everyware.com/
Claris	http://www.claris.com/

For more information on databases on the Macintosh, get a copy of Liam Breck's database development survey:

http://www.cait.wustl.edu/papers/breck.html

A NEW WEBSTAR GETS PLUGGED IN AND CAFFEINATED, WITH HELP FROM NATURAL INTELLIGENCE

The forthcoming WebSTAR 1.3 introduces the WebSTAR Server API (WSAPI), an API that allows developers to write server plug-ins. The plug-ins are similar to CGIs, but will not be restricted by Apple event limitations.

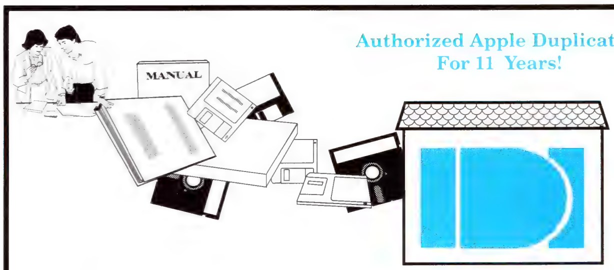
In a separate press release, Natural Intelligence announced that it is working with Quarterdeck to incorporate Java support into a future version of WebSTAR. WebSTAR will be able to execute WSAPI programs written in Java, as well as C, C++ or any other natively compiled language.

Quarterdeck, StarNine division • (510) 649-4949
Email: info@starnine.com

Quarterdeck/StarNine	http://www.starnine.com/

BARE BONES RELEASES BBEDIT 4, SOFTPOLISH 1.2

Bare Bones Software released new versions of BBEdit and SoftPolish. BBEdit, their popular text editor, now features better Frontier support for CGI developers, and code coloring for Java, C, C++, Object Pascal, Rez, 68K assembler, Fortran, Tcl, Perl, HTML, ScriptX, and GuideScript.



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SoftPolish is a quality assurance tool for Macintosh applications. It checks application resources and identifies potential problems like spelling errors, inconsistent user interface elements, resource inconsistency, and missing resources. Bare Bones has improved SoftPolish to handle more resources, including those generated by modern development environments.

Bare Bones Software • (617) 676-0650
Email: sales@barebones.com
Bare Bones Software http://www.barebones.com/

MAXUM DEVELOPMENT AND AKTIV SOFTWARE RELEASE PHANTOM WEBCRAWLER

Maxum is now the distributor of Phantom, the first commercial Webcrawler for the Macintosh. Webmasters can use Phantom to scan any Web site and build a complete index of its pages.

Once a site has been scanned, Phantom allows users to perform searches using simple queries. The program is "Web server–friendly" and follows all established rules for Web robots, and won't overload servers with simultaneous requests.

"We're thrilled to be working with AKTIV on Phantom," said John O'Fallon, President of Maxum Development. "It represents a tremendous opportunity for Webmasters to improve service to their users, with the ease of use they expect from Mac Web tools. Web crawlers and high-performance searching [are] no longer just for high-end UNIX workstations."

Maxum will be releasing Phantom version 1.1 in early June, but a public beta version will be available May 20th from Maxum's Web site. Phantom 1.1 will be an upgrade to AKTIV Software's "Duppies 1.0" and will be free to all registered users of Duppies.

Maxum Development • (708) 830-1113
Maxum http://www.maxum.com/

EVATAC RELEASES PREDITOR 3.0

Preditor brings together the ease of point-and-click editors and the power of the popular Unix-based editor Emacs. It has a plug-and-play architecture, supports various languages, allows fully styled text, supports scripting, is fully configurable, is integrated with CodeWarrior, and does much more. AppleScript can be edited, recorded and executed all within the Preditor application. The $120 price includes two updates.

Evatac • (703) 620-0669
Email: info@evatac.com
Evatac http://www.evatac.com/

QUED/M 3.0

Who would ever have thought that text editors would become a competitive niche? Recently, QUED/M released a new version, lowered their price to $69, and now comes bundled with Celestin's Apprentice CD. QUED/M 3.0 is similar to the competition, but boasts a powerful grep, noncontiguous and rectangular selection, and a new macro programming language.

Nisus Software • (800) 281-0101
Nisus http://www.nisus-soft.com/

CODEWARRIOR 9

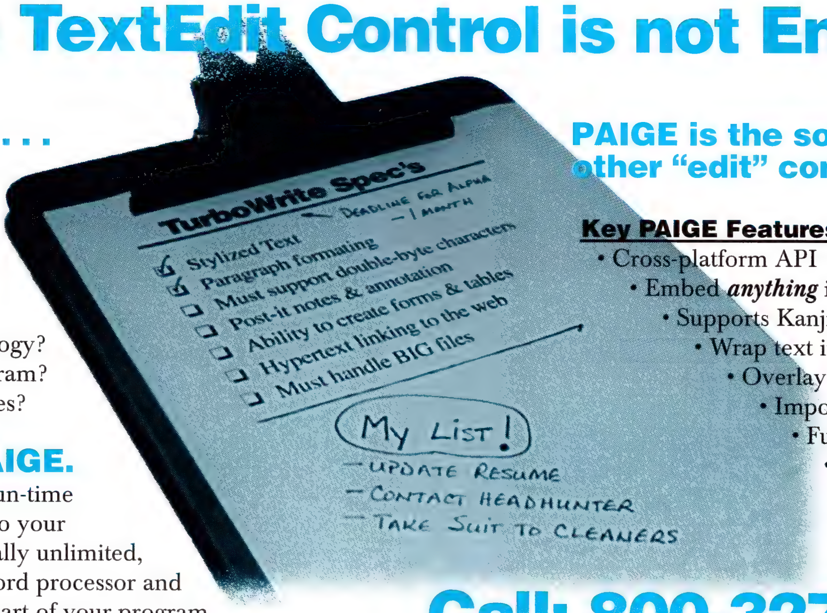
Metrowerks expanded its product line with the release of CodeWarrior 9. Now, in addition to the regular Gold subscription service, they offer a version of CodeWarrior for the BeBox, a Discover Programming Bundle for beginning C/C++ programmers, and another Discover Programming Bundle for Java programmers. There are also the Academic subscriptions for Gold.

Metrowerks http://www.metrowerks.com/

CODEWARRIOR TO SUPPORT ACTIVEX

Who would have guessed that Microsoft's Internet Explorer would turn out to be a Real Macintosh Application? Now Microsoft is getting help from Metrowerks to have Explorer run not only ActiveX controls, but Java applets as well. Furthermore, CodeWarrior will be expanded to include ActiveX development tools. ActiveX controls used to be called OLE controls.

Imagine, on your Macintosh, you can run Java applets, Microsoft ActiveX/COM objects, OpenDoc SOM objects, and CFM code! This writer is reminded of Core Wars, an old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Windows 3.1 • Windows 95 • Windows NT • Macintosh • PowerMacintosh

computer simulation where competing programs battled each other for dominance over address space.

Microsoft's ActiveX documentation
http://www.microsoft.com/intdev/inttech/controls.htm

SMALLTALKAGENTS 2.1

QKS has released an update to SmalltalkAgents. It's available at the ftp site below. Some of the new features are Code Fragment Manager support, PowerPC Accelerations, improved TCP/IP and interface classes, and WASTE text engine support.

SmalltalkAgents 2.1 now supports the Code Fragment Manager (CFM) and CFM-68K. This feature provides direct access to native PowerPC code libraries. Not only can you more easily call code written in other languages, you can also take full advantage of the increasing variety of libraries available from Apple and third parties.

With CFM support, STA is able to deliver third-party code and updaters as DLLs. STA also has an upgrade path where parts of the virtual machine can be extended with accelerated native code fragments.

TextEdit has been replaced with the WorldScript-Aware Styled Text Engine (WASTE). WASTE not only removed the 32K TextEdit limit, but also provides WorldScript awareness, styled text, and embeddable objects. WASTE is implemented as a code fragment.

For more detailed information about product improvements, see their Web site.

Quasar Knowledge Systems • Email: info@qks.com
The update is at ftp://ftp.qks.com//ftp/2.1update/
QKS http://www.qks.com/

PICTORIUS DEBUTS ENTRADA AND FREEWARE NET SERVERS

Pictorius, has released Entrada, a full-featured open database client development tool. Entrada is the new name for their Peregrine database tool. Entrada features a graphical database development environment and full programmability with Prograph.

Integrated into Entrada are the Entrada Net Servers, which allow developers to create various Internet servers using Entrada. The product supports all the popular Internet protocols, including ftp, Web, mail, DNS, OpenTransport, Finger, List, and News. The Net Servers part of the Entrada product is freeware (the entire product is commercial). The Net Servers support CGIs, ACGIs and WebStar Filters, as well as a custom technology called Agents. Together the various parts of the Entrada package allow developers to create Internet/Intranet solutions with one set of tools.

Pictorius Inc. • (902) 492-2880
Pictorius http://www.pictorius.com/

TIPS & TIDBITS

By Steve Sisak

TIP OF THE MONTH

GET VERSION NUMBER STRING

Here's a useful function that gets a version number string, suitable for display in a splash screen or an About box, directly from your `'vers'` resource.

`GetVersNumString` is a handy function that reads an application's `'vers'` resource, constructs the version number, and returns it in a Pascal string. It may not be the most efficient way to do this, but it does the job. This function will not include the third piece of the version number if it equals zero (i.e., print "1.1" not "1.1.0"). The `if` statement controlling this decision is easy to remove; more ambitious programmers might make it an optional parameter. ; -)

I've also included Str255-copy and Str255-concatenation routines to make this tip complete, just in case you don't already have your own available.

Michael Trent

```
/* GetVersNumString
 * Reads 'vers' resource #1 and constructs a string like "\p1.0d3"...
 * If it can't find 'vers' #1, it returns an empty string.
 * NOTE: The application resource file must be the active resource file!
 */
void GetVersNumString(Str255 versStr)
{
        Handle   versHdl;
        long     version;
        unsigned char   ver1,ver2,ver3,relStatus,prerelNum;
        Str255   tmp;

        // clear string;
        versStr[0]=0;
```

[*Actually, you should switch to the application resource file and use Get1Resource() here – sgs*]

```
        // read version no. information
        versHdl = GetResource('vers',1);
        if (!versHdl) {
                return;
        }
        version = *((long *)(*versHdl));
        ReleaseResource(versHdl);

        // Set ver1-3, relStatus, prerelNum from the version info.
        // Note that the first two bytes are in an unusual format.
        ver1 = ((char *)&version)[0];
        ver1 = (((ver1 & 0xF0) >> 4) * 10) + (ver1 & 0x0F);
        ver2 = (((char *)&version)[1] & 0xF0) >> 4;
        ver3 = (((char *)&version)[1] & 0x0F);
        relStatus = ((char *)&version)[2];
        prerelNum = ((char *)&version)[3];

        // Insert v1 and v2 into our version string.
        NumToString((long)ver1,tmp);
        PStringCat(versStr,tmp);
        PStringCat(versStr,"\p.");
        NumToString((long)ver2,tmp);
        PStringCat(versStr,tmp);
        // For convenience, we only print the third number if it is non-zero.
        // If you always want all three numbers, remove the if-statement.
        if (ver3) {
                PStringCat(versStr,"\p.");
                NumToString((long)ver3,tmp);
                PStringCat(versStr,tmp);
        }

        // If the release status is development, alpha, or beta, add a
        // 'd', 'a', or 'b' to our version string.
        switch(relStatus){
        case 0x20:          // development
                PStringCat(versStr,"\pd");
                break;
        case 0x40:          // alpha
                PStringCat(versStr,"\pa");
                break;
        case 0x60:          // beta
                PStringCat(versStr,"\pb");
                break;
        default:
                ;
        }

        // lastly, if we've added a 'd', 'a', or 'b', print the pre-release
        // number at the end.
        if (relStatus != 0x80) {
                NumToString((long)prerelNum,tmp);
                PStringCat(versStr,tmp);
        }
}

/* PStringCopy
 * Copy pascal string a into b.
 */
void PStringCopy(Str255 a, Str255 b)
{
        BlockMoveData(a,b, a[0] + 1);
}

/* PStringCat
 * Concatenate pascal strings a & b, return in a. If there isn't enough
 * room in our array to join both strings, return what we can.
 */
void PStringCat(Str255 a, Str255 b)
{
    short len;

    if ((a[0] + b[0]) > 255)
      len = 255-a[0];
    else
      len = b[0];

    BlockMoveData(&(b[1]),&(a[a[0]+1]),len);
    a[0] += len;
}
```

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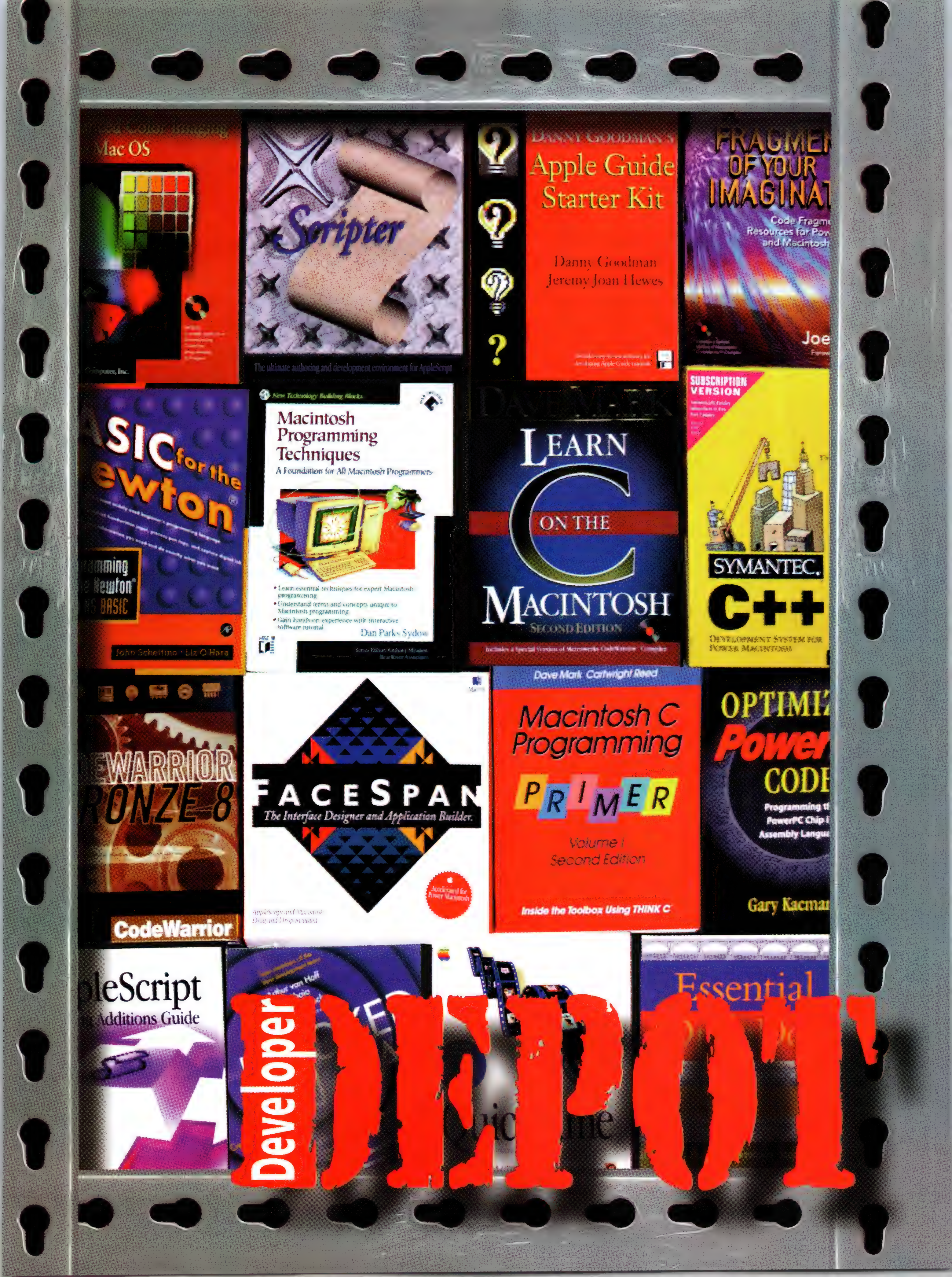
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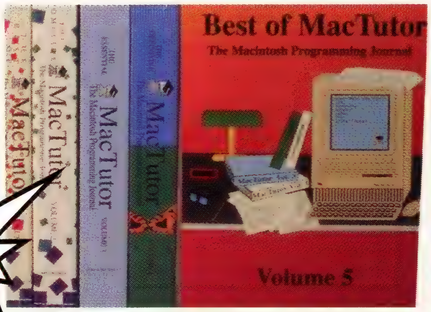

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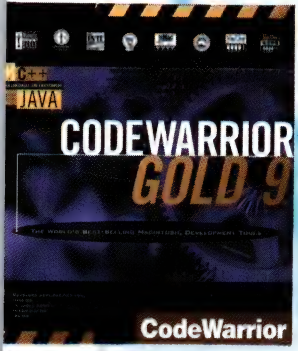

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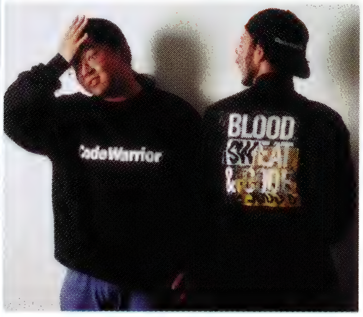

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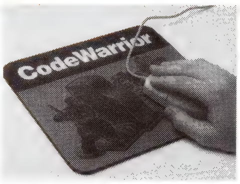

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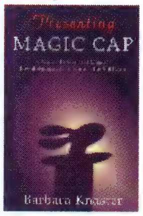

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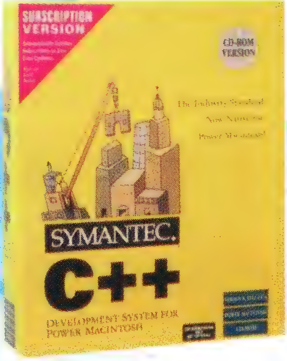

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- Works with AppleScript 1.0 or later and MacTCP 2.0.4 or later. Compatible with Open Transport™ 1.1.

Our Price **$49.00**

SEE RELATED CATEGORY: **Tools, Libs & Utilities**

OOFILE HTML Writer

The first OODBMS framework to offer a complete solution for application authors. Replaceable backend database, currently Faircom's c-tree Plus for cross-platform royalty-free power. PowerPlant and other frameworks integrated with edit fields, database browsers and more. AppMaker users, generate complete applications. User-friendly syntax makes it easier to migrate from FoxPro and the non-OO world. Demo's on CodeWarrior and AppMaker CD's. **$900.00** for a once-off c-tree bundle, or **$1,095.00** 1year subscription. HTML and character-mode report-writer **$195.00**. Full GUI report-writer, including HTML, is **$495.00**. Mac Platform Bundle - includes all Mac frameworks, c-tree, and Report-Writer. **$1,495.00**

Wanna see your product move?

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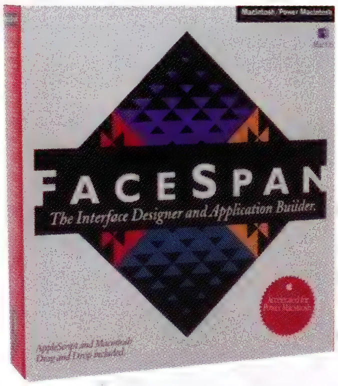
The fastest, cost effective way to get product off your shelves.

For information: • Voice: 805/494-9797 • Fax: 805/494-9798 • E-mail: marketing@devdepot.com

DataScript

• Make your integrated AppleScript solutions database aware-today. • Takes just six lines of AppleScript to make new or existing scripted solutions database aware, and fetch data from RDBM's such as Oracle, Sybase, DB2, or Informix. • Easy to learn, easy to use, and easy to remember. "Inside DataScript" contains lots of easy to follow scripts to reuse in your own solution. • Very attractive licensing schemes.

List $249.00 Our Price **$229.99**



FaceSpan™ v2

Build applications quickly and easily!

- Extensible Rapid Application Designer (RAD).
- Combines an interactive, visual interface design environment with the object-oriented power of AppleScript or any OSA language.
- Integrate the capability of scriptable programs into your custom application.
- Display scrolling lists, popup menus, scrolling text, movies, multi-column tables, pictures, icons, buttons, and others.
- Program custom objects using Pascal or C.
- Includes a royalty-free distribution license, for unlimited runtime users, of your FaceSpan-based applications. Plus a FREE UPGRADE to the next version for registered users!

List $199.00 Our Price **$179.00**

Script Debugger by Late Night Software Ltd.

- A powerful and flexible AppleScript authoring tool – get the most from AppleScript!
- Advanced debugging environment offers single-step script execution with breakpoints.
- Script Debugger dictionary browser features a graphical view of objects provided by scriptable applications.
- Includes Late Night Software Scripting Additions – a collection of more than 70 new AppleScript commands, and Scheduler, a utility that allows you to launch scripts at pre-determined times.

List $129.00 Our Price **$119.99**

PreFab Player by PreFab Software, Inc.

- Lets your scripts query and control otherwise non-scriptable applications, desk accessories and control panels.
- Adds verbs that directly manipulate the Macintosh user interface: choose from menus & pop-ups, select radio buttons, type text, determine the name of the frontmost window, the state of a check box, etc. Balloon help identifies non-standard dialog items.
- Offers a simple, inexpensive way to distribute scripts and updates.
- Use a standard scripting system for automated testing.
- Requires: AppleScript or Frontier

Our Price **$95.00**

ScriptWizard™ 1.5

• Combines the power of a professional development environment with the Mac's ease of use. • Compatible with all Apple® Open Scripting Architecture languages, including AppleScript™. • Includes delivering testing and debugging facilities to improve your productivity. • Emphasizes features that speed script development. • Single-step scripts with true statement-level stepping, watch variable values as scripts execute, jump instantly to frequently used places in a script and find and replace specific text.

List $89.00 Our Price **$84.95**

Scripter®

- Powerful and easy to use, for both novices and experts.
- Includes Superior vocabulary access – point-and-click assembly of commands and object specifications; command window for experimentation.
- Includes Shortcuts and extended editing capabilities – extensive drag-and-drop, six-function find-and-replace; navigation markers; script library collection facility; many other timesavers for faster scripting.
- Interactive debugging – comprehensive variable watcher, expression evaluation, enhanced trace log, and real single step debugging!

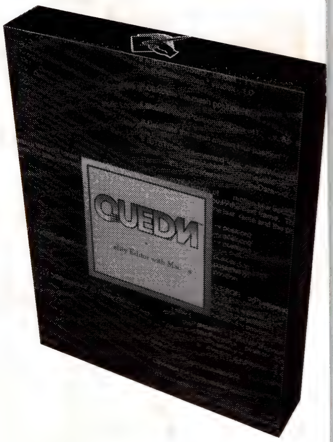
List $199.00 Our Price **$179.00**

SEE RELATED CATEGORY:
Internet Related

BBEdit 4.0 from Bare Bones Software

- A powerful, easy-to-learn text editor.
- Adds new features for HTML coders, including a spelling checker and HTML tag palette
- Accelerated for Power Macintosh; dragging supported everywhere; Internet Config aware; PowerTalk aware.
- Integrated support for Symantec's IDE, Metrowerks CodeWarrior, THINK Reference 2.x, MPW ToolServer, and most other environments.
- Many UNIX style tools, including "grep" searches, file comparisons, and sorting. Multi-file search and replace.
- PopUpFuncs feature lets you jump to a function from a menu.

List $119.00 Our price **$94.00**



QUED/M 3.0 by Nisus Software

- The programmer's text editor that defined the industry standard for speed and efficiency.
- Power PC native.
- Features integrated support for Symantec C/C++, Metrowerks CodeWarrior 6, and MPW.
- Supports all the major development environments on the Macintosh.
- Dozens of powerful editing features, including unlimited undo and redo, macro language, scripting, text folding, ten editable/appendable clipboards, markers, displaying text as ASCII codes, dynamic coloring of C/C++ keywords/comments, rectangular and non-contiguous selection.
- Includes Celestin Company's APPRENTICE 4.

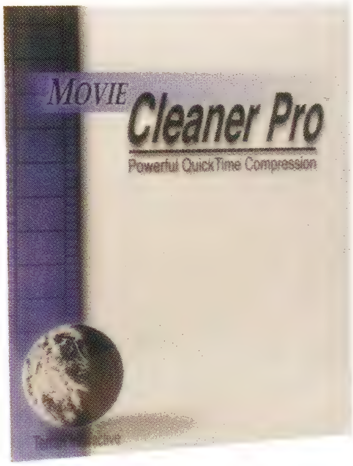
List $149.00 Our Price **$89.00**

CMaster 2.0 by Jersey Scientific

- Installs into THINK C 5 / 6 / 7 and Symantec C++ for Macintosh and enhances the editor.
- Use its function popup to select a function and CMaster takes you right to it!
- Multiple clipboards and markers, a Function Prototyper, and a GoBack Menu which can take you back to previous editing contexts.
- Almost all features bindable to the keyboard, along over a hundred keyboard-only features like "Add New Automatic Variable." Glossaries, AppleScript and ToolServer support, Macros, and External Tools you create too!

Our Price **$129.95**

SEE RELATED PRODUCTS:
Quick Time Starter Kit



Movie Cleaner Pro 1.2 by Terran Interactive

- Compress QuickTime movies
- Powerful and easy-to-use
- Includes: drag and drop batch processing, suspend and resume, high quality crop and resize, A/V fades, and much more.
- Automatically suggests the best settings for your application.
- Great for both beginners and experts
- Essential for CD-ROMs or Web sites

Our Price **$189.95**

SEE RELATED PRODUCTS:
Quick Time Official Guide

One & 2-Day SHIPPING
(call for details)

CodeManager by Metrowerks

SEE RELATED CATEGORY:
Dev. Environments

- Source code control system for the Macintosh.
- Based on and compatible with Microsoft Visual SourceSafe version 4.0.
- Works with any type of binary file including graphic, database, library and executable files.
- Includes support for multi-platform projects, security features, reverse delta versioning of files, comment areas for each revision, project analysis and reporting tools.
- Sold on a subscription basis with two future product updates.
- **Includes a 1 year MacTech subscription.**

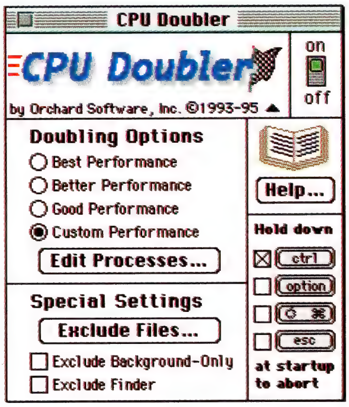
Our Price **$399.00**

CPU Doubler by Orchard Software

SEE RELATED PRODUCTS:
Cron Manager

- Performance enhancement utility for the Macintosh.
- Increases the speed of your computer by 100%.
- Works on both the PowerPC and 68K Macintosh.
- Manages computer throughput using a proprietary scheduling algorithm.
- Ensure optimal performance and compatibility.

Our Price **$79.95**



CPU Doubler

CPU Doubler
by Orchard Software, Inc. ©1993-95

on
off

Doubling Options
○ Best Performance
○ Better Performance
○ Good Performance
● Custom Performance
Edit Processes...

Help...

Hold down
☒ ctrl
☐ option
☐ ⌘
☐ esc
at startup to abort

Special Settings
Exclude Files...
☐ Exclude Background-Only
☐ Exclude Finder

CLImate by Orchard Software

- Command line interface that lets you communicate with your Macintosh using English commands to create, delete, rename, and move files and folders.
- Start applications, format disks, restart your computer, etc.
- Supplements the Finder.
- Includes a BASIC interpreter that lets you script your Macintosh without AppleScript.
- Includes advanced programming constructs: repeat loops, if/then/else conditionals, subroutine calls, etc.
- Implements wildcard characters, enabling you to work on groups of files.
- Comes bundled with sample programs and full documentation.
- Includes a free copy of Cron Manager – chronological event management utility.

Our price **$59.95**

File Genie Pro by Duet Development

FILE genie PRO

- File Genie Pro lets you search ALL your developer CD-ROMs at once!
- Every Dev CD, OS SDK, CodeWarrior CD, E.T.O., and Bookmark CD you insert is cataloged automatically. A typical Dev CD with 10,000 files is cataloged in under 10 seconds.
- You can also catalog opticals, SyQuests, and floppies.
- File Genie Pro quickly finds any file on any disk by searching hard disks, network servers, and catalogs. Open, show, print, and more. View text and graphics files without opening other applications.
- When acting on an ejected disk file, File Genie Pro tells you which disk to insert, then continues automatically.

Our Price **$89.00**

Order Toll-free
800-MACDEV-1
(800-622-3381)

Guide Composer™ 1.2 by StepUp Software

NEW!

SEE RELATED PRODUCTS:
Real World AppleGuide

SEE RELATED PRODUC
AppleGuide Complete

SEE RELATED PRODUC
Danny Goodman's AppleGuide Starter Kit

- Create powerful Apple Guide help systems for any new or existing Macintosh application.
- Great for commercial developers, shareware developers, in-house developers, and consultants.
- Provides a WYSIWYG development environment: Guide content is developed in Guide windows.
- Design topics, phrases, and panels in the same format as the user will use them. Features are WYSIWYG interface, Topics, phrases, and hierarchical phrases, Coach marks, Fully-Integrated with Apple's Guide Maker (distributed with Guide Composer), compiles scripts automatically, PICTs in Panels, Generated Guide scripts are modifiable.
- Compiled files are 100% AppleGuide-compatible and royalty-free. Easy-to-use.

New features include:

- Add up to six radio buttons on an Apple Guide panel, each of which can branch to another sequence or topic
- Add up to six checkboxes on an Apple Guide panel, each of which can insert another sequence or topic into the current topic and much more!
- FREE Update to all registered Guide Composer users. Demo is available at http://www.guideworks.com/.

Our Price **$99.00**

ScriptGen Pro by StepUp Software

- Installer script generator which requires no programming or knowledge of Rez.
- Supports StepUp's InstallerPack, StuffIt compression, custom packages, splash screens, network installs, Rez code output, importing resources, and AppleEvent link w/MPW

Our price **$169.00**

Step-Up Installer Pack by StepUp Software

- Package of several Installer "atoms" that let developers incorporate graphics, sounds, file compression and custom folder icons into installation scripts.
- Compression formats supported are Compact Pro & Diamond.
- Each atom also available separately.
- Compression requires additional licensing.

Our price **$219.00**

CronManager
by Orchard Software

SEE RELATED PRODUCTS:
CPU Doubler

- Implements the UNIX Cron facility.
- Open any Macintosh file on a given date and time.
- Simple interface.
- Works with any Macintosh file.
- Cron Manager bundled with CLImate,

Our price **$26.95**

Tenon Ported Application CD

- Contains hundreds of applications that have been pre-compiled to run on Personal or Professional MachTen 68k systems, such as Unix, Perl, and TCL/TK
- Includes many internet servers such as Gopher, WAIS Ported Application CD Vol. 1 (for 68K Macs).

Our price **$49.95**

Rosanne

SEE RELATED CATEGORY:
Scripting

- A collection of utilities which offer the user complete control over raw data.
- Sort files, extract selected records, summarize frequency counts, create sample files, perform matching on multiple files, and reformat data to new specifications, all on the desktop, and even on files of a million records or more.
- Supports AppleScript™, enabling the user to link several actions together to complete an entire process.
- Recordable – users may perform a series of actions, and see them translated directly into AppleScript commands.
- Supports multi-tasking and background processing.
- Rosanne Utilities: Copy, Format, Select, Recode, Sort, Match, and Aggregate

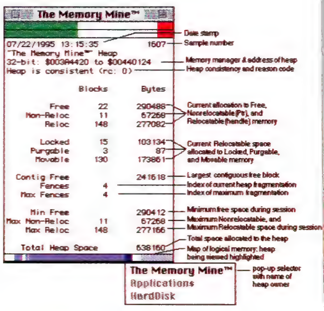
Our Price **$595.00**

Memory Mine by Adianta

SEE RELATED CATEGORY:
Dev. Environments

- Monitor heaps, identify problems such as memory leaks, and stress test applications
- Active status of memory in a heap is sampled on the fly: allocation in non-relocatable (Ptr), relocatable (Handle) and free space is shown, as are heap corruption, fragmentation, and more
- Allocate, Purge, Compact, and Zap memory lets users stress test all or part of a program
- Works on Macintoshes with 68020 or later and System 7.0 or later.

List $99.00 Our Price **$94.99**


The Memory Mine™
Date stamp
Sample number
Memory manager & address of heap
Heap consistency and reason code
Current allocation to Free, Nonrelocatable (Ptr), and Relocatable (handle) memory
Current Relocatable space allocated to Locked, Purgable, and Movable memory
Largest contiguous free block
Index of current heap fragmentation
Index of maximum fragmentation
Minimum free space during session
Maximum Nonrelocatable, and
Maximum Relocatable space during session
Total space allocated to the heap
Map of logical memory: heap being viewed highlighted
pop-up selector with name of heap owner
The Memory Mine™
Applications
HardDisk

```
07/22/1995 13:15:35          1607
"The Memory Mine™" Heap
32-bit: $003A4420 to $00440124
Heap is consistent (rc: 0)

              Blocks       Bytes

       Free       22      290488
  Non-Reloc       11       67268
      Reloc      148      277082

     Locked       15      103134
   Purgable        3          87
    Movable      130      173861

Contig Free               241618
     Fences        4
 Max Fences        4

   Min Free               290412
Max Non-Reloc     11       67268
  Max Reloc      148      277166

  Total Heap Space        638160
```

QC by Onyx Technology. High performance runtime stress testing for applications.

- Tests include heap checks, purges, scrambles, handle/pointer validation, dispose/release checks, write to zero, de-reference zero as well as other tests like free memory invalidation and block bounds checking.
- Extremely user friendly – ideal for non-programmer testers.
- Also available in Japanese.

List $99.00 Our price **$94.99**

SEE RELATED CATEGORY: **Dev. Environments**

Last Resort Programmers Edition

- Records every keystroke, command key and mouse event (in local coordinates) to a file on your hard disk
- Great for program testing & debugging, and for technical support and help desks
- Last Resort keystroke files and recovers what you typed – great for data losses caused by power failure, crashes, or accidental deleting.

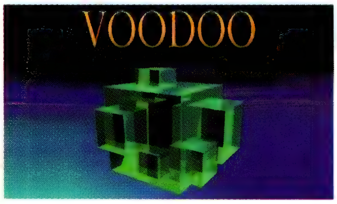
Our price **$74.95**

Spyer by InCider

- Easy to use tool that records all actions (including mouse movement) you perform on a Macintosh computer and then replays them at your preferred speed.
- Recorded data can be saved in files for future use.
- Works as a background process with any Macintosh application and is triggered by user defined Hot Keys.
- Enables the "Continuous Redo" utility and is especially useful for software testing and demonstration.

Our price **$39.00**

VOODOO



- Version control tool for the simple and clear management of projects in which files are created in numerous versions (variants and revisions).
- Allows both variant and revision control, and it manages not only variants and revisions of single files, but of a whole software project (multi files, multi users, multi variants, access rights, etc.)
- Graphical user interface and is not only suitable for mere source code control but can handle all different kinds of files with amazing compression rates: typical size of delta between arbitrary files 5%
- Please note special prices for multiple copies:

Single license **$229.00**; 2 pack **$359.00**; 5 pack **$799.00**; 10 pack **$1369.00**; 20 pack **$2399.00**

Additional pricing available on request.

SoftPolish CD-ROM by Bare Bones Software

- The essential tool for software quality assurance on the Macintosh
- Helps you identify inconsistencies with Apple's user interface guidelines, misspelled words, missing resources, and other mistakes

- Provides tools to put the finishing touches on software distribution packages prior to release
- Works independently of any programming language or environment
- Ideal for sanity checking software throughout the development process.

List price: $99 Our price: **$89**

LJ Profiler by Lars Jordebo Datakonsult

- Supports profiling of C++ 68K and PowerPC applications compiled with CodeWarrior, CFront or Symantec C++.
- Based on active profiling, i.e. profiling code called at function enter and exit, the browser application lets you follow call chain timings in hierarchical views or separate windows.
- Collect, organize, compare and save profiling data from different versions of your application into a project. Scriptable and recordable with full access to most internal data structures.
- Optional remote profiling and tracking of segment and stack usage. Full source code to what you link into your application.

Our price **$295.00**

PowerTap™

- Accelerates software by tapping into multiple processors.
- Easy API – submit tasks and retrieve results!
- Full error recovery system plus scheduling algorithms for optimal assignments and fastest possible execution.
- Compatible with all Macintosh hardware, software and major compilers.

PowerTap/2, 2 remotes edition	List $1,200.00	Our Price **$1,099.99**
PowerTap/5, 5 remotes edition	List $1,900.00	Our Price **$1,799.99**
PowerTap/n, unlimited edition	List $2,700.00	Our Price **$2,499.99**

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StoneTable

- Replaces all functions found in list manager
- Variable size columns/rows; different font, size, style, forecolor, backcolor per cell; sort, resize, move, copy, hide columns/rows; edit cells/titles in place; titles for columns/rows; multiple lines per cell; grid line pattern/color; greater than 32k data per table; up to 32k text per cell; support for balloon help and binary cell data. Versions for Think C, Think Pascal, MPW C, MPW Pascal, CodeWarrior 6 C.

StoneTable Extra

- Drag selected cells within table or to other tables.
- Add rows as part of drag; popup menus or check boxes in cells; variable width grid lines; move/drag/resize table in window; clipboard operations on multiple cells.
- Requires StoneTable.

This product can now be ordered in 3 different packages.

68K StoneTable

This includes StoneTable, StoneTableExtra for Think Pascal, Think C, MPW C, MPW Pascal, CodeWarrior C, CodeWarrior Pascal

Our price **$175**

PPC StoneTable

This includes StoneTable PPC, StoneTableExtra PPC for Think C, MPW C, MPW Pascal, CodeWarrior C, CodeWarrior Pascal

Our price **$175**

68K/PPC StoneTable

Includes both packages

Our price **$325**

PictureCDEF 1.3 by Paradigm Software

- Professional-level CDEF for creating custom graphical buttons (8-64 pixels) – used in products by Adobe, ProVue, STF Technologies and others!
- Multi-monitor and bit-depth sensitive.
- The button graphic (cicn, ResEdit) can be changed at runtime and even animated with a call-back routine.
- Create distinct buttons in seven variations: MultiState, PushButton, FlexiButton, ToggleButton, ChkButton, PushPictButton and TogglePictButton.
- Manual, sample code and MacApp 3.0 support included.

Full source code: **$95.00** Object code: **$45.00**

SpellsWell 7 1.0.4

- Award-winning, comprehensive, practical spelling checker that works in batch mode or within applications that incorporate the Apple Events Word Services protocol (e.g., Eudora, WordPerfect, Communicate!, and Fair Witness).
- Checks for spelling errors as well as common typos like capitalization errors, spaces before punctuation, double word errors, abbreviation errors, a/an before vowel/consonant, etc.
- MacTech orders include developer kit with Writeswell Jr., a sample AppleEvents Word Services word-processor and its source code.

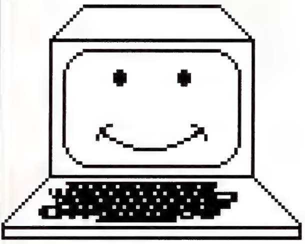
Our price **$74.95**

MacWireFrame by Amplified Intelligence

- Create your own virtual reality application with MacWireFrame, a virtual reality application framework.
- Includes a complete library of object oriented graphics routines.
- Easy to understand application frame work, plus an example application program that lets you start solid modeling right away.
- Complete with fully documented source code.
- Guaranteed $49.99 upgrade to the soon to be released, scriptable, MacWireFrame 5.0.

List $299.00 Our Price **$75.00**

Order Toll-free
800-MACDEV-1
(800-622-3381)



B-Tree HELPER™ 2.2

- Inexpensive database engine for Macintosh programmers in C source code.
- Uses contiguous fixed length blocks.
- Expands the file as necessary and contracts files when possible.
- Inserts and deletes keys in one or more B-Trees.
- Finds keys equal to, less than, or greater than a given value in a few hundredths of a second.
- Finds lists of records whose keys are equal to, less than, or greater than a given value or are in a range of values.

Our Price **$150.00**

Q3S/3dPane/SmartPane

ViviStar CONSULTING

- Full featured 3d graphics library.
- Polyhedra; Gouraud shading; stereoscopic projections; pipeline access; animation and model interaction support; a “triad mouse” to map 2d mouse movement to 3d; and all the regular 3D features.
- 3dPane provides integration with the TCL and provides a view orientation controller. SmartPane provides TCL offscreen image buffering, flicker free animation, and QuickTime movie recording. SmartPane functions in 3d or 2d scenarios.
- All work with C++ compilers or ThinkC 6 and compile to PowerPC or 68K target machines.

Our Price **$192.00**

dtF

- True relational database system for Apple Macintosh computers.
- Provides a powerful choice for developers who want to create database centered applications with no performance trade-offs.
- Features SQL, full transaction control, error recovery, single user, client server architecture and multi-platform support including DOS, Windows, OS/2 and UNIX.
- The C/C++ API is identical and fully portable across all supported platforms.
- Third-party vendors supporting dtF will be able to offer a variety of advanced features and benefits to their customers royalty free.
- Tools are included for importing, exporting, creating and managing databases and users.
- Supported development environments include: Symantec, MPW, Metrowerks and more. Mac/SDK

List $695.00 Our Price **$679.99**

OOFILE

SEE RELATED PRODUCTS:

OOFILE HTML Writer

- First OODBMS framework to offer a complete solution for application authors.
- Replaceable backend database, currently Faircom’s c-tree Plus for cross-platform royalty-free power.
- PowerPlant and other frameworks integrated with edit fields, database browsers & more. AppMaker users, generate complete applications.
- User-friendly syntax makes it easier to migrate from FoxPro and the non-OO world.
- **$900.00** for a once-off c-tree bundle, or **$1,095.00** 1-year subscription.
- HTML and character-mode report-writer. Our Price **$195.00**.
- Full GUI report-writer, including HTML. Our Price **$495.00**.
- Mac Platform Bundle - includes all Mac frameworks, c-tree, and Report-Writer. Our Price **$1,495.00**

NeoAccess™

- Full-featured object database engine for use in Macintosh, Windows, Unix and DOS based C++ applications.
- Extended binary trees and binary search algorithms tuned for short access times; dynamically combined, collapsed, and compressed indices; object caching for instant access to previously used objects.
- Build fast, powerful applications in record time!

Our price **$749.00**

Lowest price guaranteed.

Feel Good about your purchase!

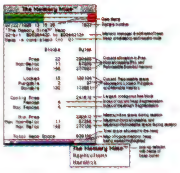
30-day return policy.

AppMaker

- Develop the user interface for a Macintosh application using the original interface builder.
- Just point and click to design your application.
- Creates resources and generates excellent source code.
- Supports most development environments including Metrowerks, Symantec, or MPW; C, C++, or Pascal; procedural or object-oriented, using PowerPlant, TCL, or MacApp.
- The generated code uses the Universal Headers to provide PowerMac compatibility.
- Great tool for beginners to learn object-oriented and Macintosh Toolbox programming techniques.
- Includes one-year subscription on CD.

Includes CD-ROM!

List $299.00 Our Price ~~$279.99~~ SPECIAL PRICE! **$149.00**



MacDesigner/Expert by Excel Software

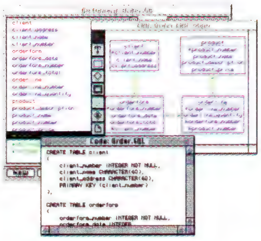
- Supports software engineering methods with the capabilities of MacDesigner plus multi-task design.
- Integrated requirement database provides traceability from requirement statements to design diagrams, code or test procedures.
- Suited to design or maintenance of real-time, multi-tasking software projects.

Expert Demo **$79.00**; Expert Product **$1595.00**; MacDesigner Demo **$79.00**; MacDesigner **$995.00**

MacAnalyst/Expert by Excel Software

- Supports software engineering methods with the capabilities of MacAnalyst plus state transition diagrams, state transition tables, decision tables and process activation tables
- An integrated requirement database provides traceability from requirement statements to analysis or design diagrams, code or test procedures
- Well suited to the analysis and design of real-time or requirements driven projects.

Expert Demo **$79.00**; Expert MacAnalyst **$1595.00**; MacAnalyst Demo **$79.00**; MacAnalyst **$995.00**



```
CREATE TABLE client
(
    client_number INTEGER NOT NULL,
    client_name CHARACTER(40),
    client_address CHARACTER(40),
    PRIMARY KEY (client_number)
);

CREATE TABLE orderform
(
    orderform_number INTEGER NOT NULL,
    orderform_date INTEGER
```

MacA&D by Excel Software

- Combines the capabilities of MacAnalyst/Expert and MacDesigner/Expert into a single application.
- Supports structured analysis and design, object-oriented analysis and design, real-time extensions, task design, data modeling, screen prototyping, code editing and browsing, reengineering, requirement traceability, and a global data dictionary.

MacA&D Demo **$149.00**; MacA&D **$2995.00**

ICONIX Power Tools - Ten modules that can be used either as stand-alones or combined to form a custom, integrated development environment with dictionaries and Language Sensitive Editors

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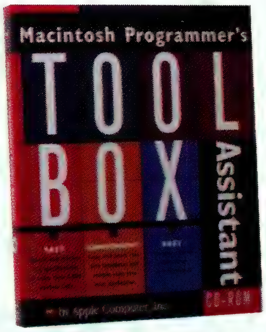

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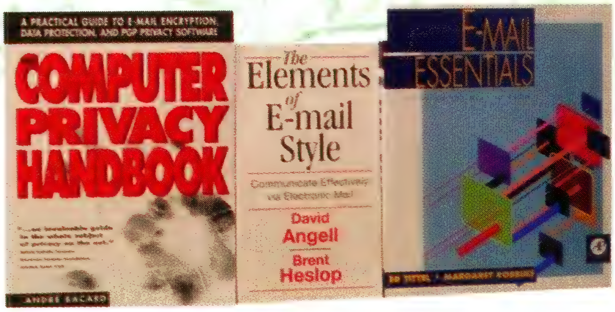

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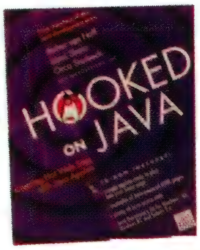

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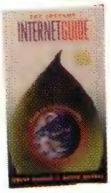

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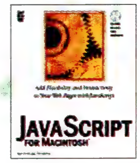

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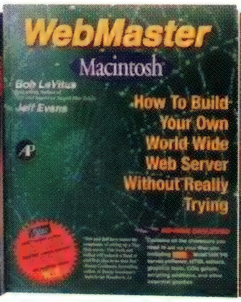
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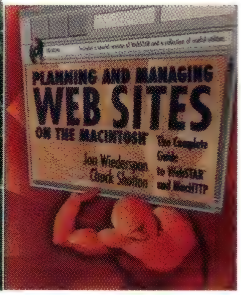

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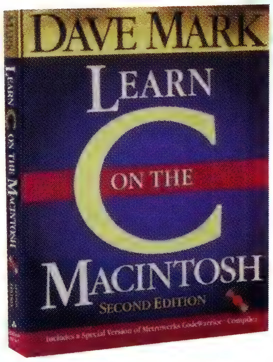

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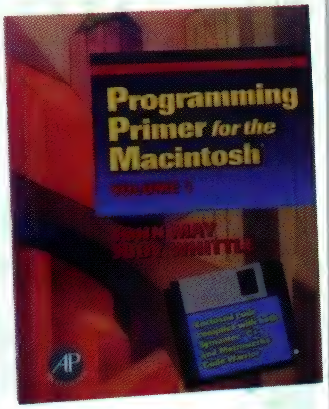

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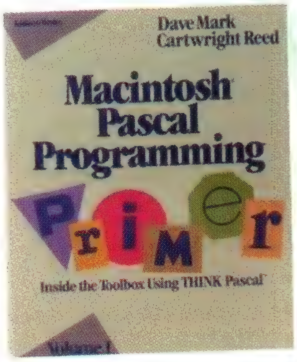
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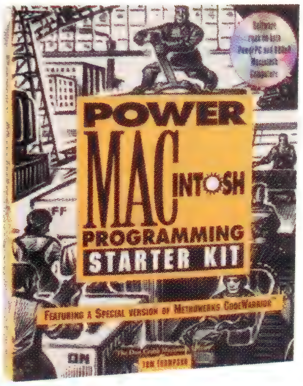
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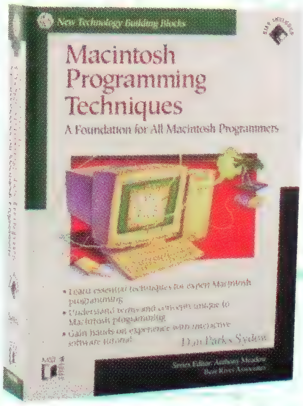
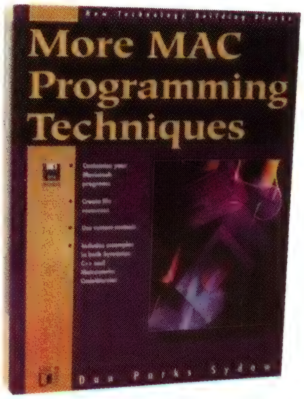

New Technology Building Blocks
Macintosh Programming Techniques
A Foundation for All Macintosh Programmers
Dan Parks Sydow


New Technology Building Blocks
More MAC Programming Techniques
Dan Parks Sydow

More Mac Programming Techniques

- Hands-on guide and tutorial, expands on the basic foundation of programming to develop truly powerful applications.
- Take a detailed look at the units of a Macintosh program – from the INITs to custom controls.
- Packed with solid tricks and techniques.
- Learn file resources from the ground up, and how to build custom menus, add custom controls, including buttons, and slider controls, MDEF, CDEF resources and much more.

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Programming with AppleTalk by Michael Pierce

- Programming with AppleTalk is the hands-on guide to understanding and working with AppleTalk.

Topics covered include:

- How to create applications and system extensions that run with AppleTalk.
- AppleTalk protocols and the protocol stack, transport media, the Preferred AppleTalk Inteface, and the storage management.
- Numerous working code examples walk you through using RDEV, INIT, NBP, ATP, and ADSP You will also learn the use of: Synchronous, and asynchronous calls, How to avoid heap fragmentation, And how to configure a Chooser Interface.

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A Fragment of Your Imagination by Joe Zobkiw

- Packed with useful code fragments for the Macintosh and Power Macintosh.
- Hard to find information about techniques used to structure and build fat, safe fat, and accelerated code resources.
- All code is reusable and is provided on the disc, along with Metrowerks Code Warrior Lite. Book/CD-ROM, 528 pages.

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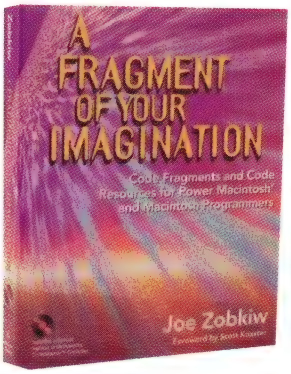
Includes CD-ROM!


A FRAGMENT OF YOUR IMAGINATION
Code Fragments and Code Resources for Power Macintosh and Macintosh Programmers
Joe Zobkiw

Programming QuickDraw

- Learn to build color pictures on the Mac
- Learn to maintain the highest degree of compatibility for you applications across the Mac platform
- Learn to perform sophisticated image processing operations with CopyBits( ) and CopyDesk( )
- Learn to enable your applications to take advantage of QuickDraw compliant graphics hardware and accelerators.

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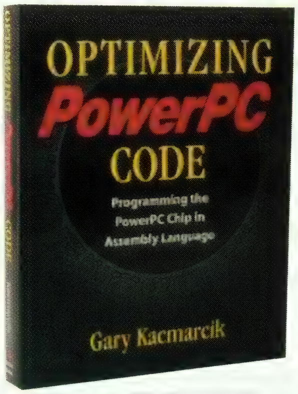

Optimizing PowerPC Code: Programming the PowerPC in Assembly Language

- Take full advantage of the potential of the PowerPC by mastering the Assembly Language techniques.
- Learn to produce faster more robust software!

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Inside Macintosh®: PowerPC Numerics

by Apple Computer, Inc.

- Describes the floating-point numerics environment provided with the first release of PowerPC processor-based Macintosh computers.
- Provides a description of the IEEE standard 754 for binary floating-point arithmetic., and how RISC Numerics compiles with it.
- Shows programmers how to create floating-point values and how to perform operations on floating-point values in high-level languages such as C and in PowerPC assembly language.

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Inside Macintosh®: PowerPC System Software by Apple Computer, Inc.

- Describes the new process execution environment and system software services provided with the first version of the system software for Macintosh on PowerPC computers.
- Contains information to write applications that can run on the PowerPC.
- Shows how to make your software compatible with the new run-time environment provided on PowerPC-based Macintosh computers. It also provides a complete technical reference for the Mixed Mode Manager, the Code Fragment Manager, and the Exception Manager.

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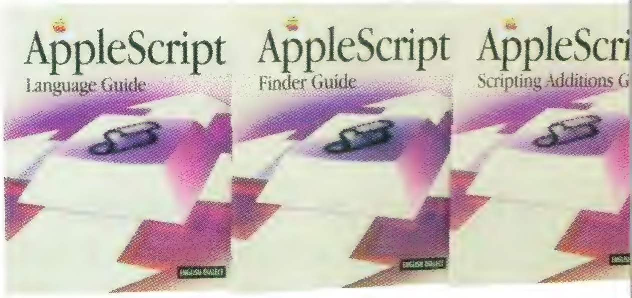

AppleScript Finder Guide, English Dialect by Apple Computer, Inc.

- Provides definitions for Finder object classes and commands.
- Write, record, or run scripts that trigger the same desktop actions that you trigger using the keyboard and mouse.

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AppleScript Language Guide,

by Apple Computer, Inc.

- A complete reference for anyone using AppleScript to modify existing scripts or to write new ones.
- Contains useful information for programmers who are working on scriptable applications or complex scripts.
- Features detailed definitions of AppleScript terminology and syntax in the following categories: Value classes, commands, objects and references to objects, expressions, control statements, handlers, and script objects.
- Includes many sample scripts, discusses advanced topics such as writing command handlers for script applications, the scope of script variables and properties declared at different levels in a script, and inheritance and delegation among script objects.

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AppleScript Scripting Additions Guide

by Apple Computer, Inc.

- Use the standard scripting additions commands.
- Write scripting additions.

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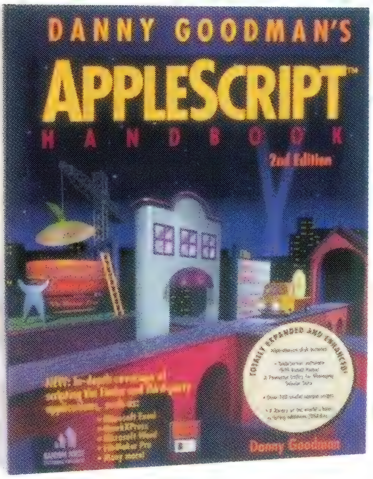

Danny Goodman's AppleScript Handbook Second Edition by Danny Goodman

- Customize and extend the capabilities of any Macintosh computer – no programming experience needed!
- Learn to use scripts to enhance the Macintosh environment, automate many processes, link data between applications, and much more.
- All-new examples showing how to integrate AppleScript with the Finder, spreadsheets, desktop publishing programs, graphics applications, databases, telecommunications programs, utilities, and HyperCard.
- Includes 3 1/2" disk with over $100 worth of software, including AppleScript 1.1, valuable utilities, and powerful, ready-to-use scripts.

Includes Disk!

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Applied Mac Scripting

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- Learn to design and develop powerful scripts.
- Covers AppleScript™, Frontier, QuicKeys, Tempo II, nShell, FaceSpan Application Builder, Scripting PlainTalk and System 7.5.
- Hands on tutorial shows you how to automate your Macintosh activities by learning how to use the AppleScript and Frontier scripting environments.
- Harness the capabilities of a wide variety of Macintosh applications into the integrated productivity tools. This includes such things as the newspaper script which combines the power of SITcomm, MacWrite Pro, and FileMaker Pro, or QuarkXPress.

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The Tao of AppleScript: BMUG's Guide to Macintosh Scripting, Second Edition by Derrick Schneider & Hans Hansen

- A complete, natural introduction to AppleScript programming essentials.
- Learn to customize applications, automate tedious tasks, and create programs without having to use a complex programming language.
- Includes 2 disks containing AppleScript, QuickTime, StuffIt Lite, ResMover, and other helpful utilities.
- Loaded with practical examples for easy learning

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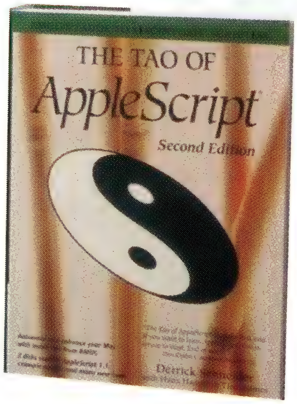

ScriptBase™ by Main Event Software

- A database for storing persistent objects to be made available for access to AppleScript, Apple's system-level user scripting language for controlling applications on Macintosh® computers.
- Once installed, the database becomes part of the AppleScript system, adding a host of commands to the basic AppleScript vocabulary. Retrieving the objects is simple using AppleScript's natural-language syntax and structure. Objects stored and retrieved in ScriptBase can be accessible any time from any script on the user's computer. These objects can be of any type, including numbers, character strings, lists, records, scripts, and references to disks, files, folders, as well as abstract raw data, to name just a few.
- ScriptBase can be used to maintain system-wide settings, such as sets of preferences, paths to frequently-used files or folders. Complex installations can be made easier by organizing data and scripts within the database's structure.

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SEE RELATED CATEGORY: **Scripting**

The Complete AppleScript Handbook by Danny Goodman

Master AppleScript with the definitive book/disk toolkit. This self-contained toolkit teaches you AppleScript from the ground up providing you with tools you need to automate tasks and integrate Macintosh applications. This book explains in detail all commands and usage of the AppleScript language including:

• Issuing command • Describing objects • Working with values, variables, and expressions • Using if-then constructions, loops and subroutines • Error checking and debugging • Scripting Finder-level processes • Using AppleScript with third party applications

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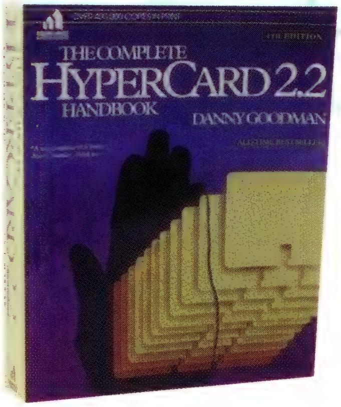

The Complete HyperCard® 2.2 Handbook Fourth Edition

by Danny Goodman

- The biggest-selling programming Mac book.
- Learn to build working applications using the latest version of HyperCard.
- Covers text, painting tools, extension commands (XCMDs), scripting in HyperTalk, and more.

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SEE RELATED CATEGORY: **Scripting**

HyperTalk® 2.2: The Book Second Edition

by Dan Winkler, Scott Kamins, and Jeanne DeVoto

SEE RELATED CATEGORY: **Scripting**

- The most complete, authoritative source on HyperTalk 2.2 programming and troubleshooting
- Covers each language element of HyperTalk 2.2 (including the odd quirk or bug).

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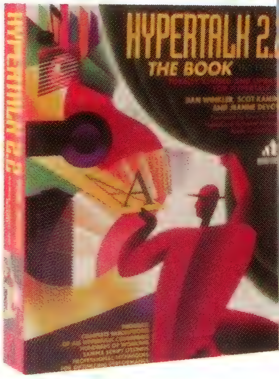

HyperCard Stack Design by Apple Computer, Inc.

HyperCard Stack Design Guidelines is an essential book for everyone who creates Apple® HyperCard stacks. Included are illustrated discussions of:

- Guidelines for stack development-audience evaluation, subject matter requirements and constraints, mode of presentation, and testing
- Navigation, the importance of making sure users can get around in your stacks
- Graphic Design and illustration- including the use of grids to determine card and background layout
- Text in stacks- placement, readability, and special considerations when writing for the screen
- Music and sound in stacks-as subject matter, reinforcement, entertainment, alert mechanism, or transition

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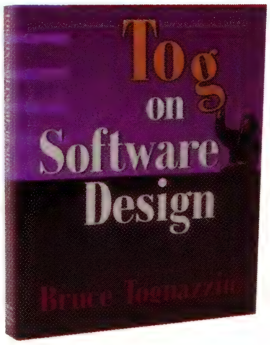

Tog on Software Design by Bruce "Tog" Tognazzini

Respected industry futurist, Tog, presents his vision of our technological future, detailing the steps computer professionals need to take to deliver new technologies that will profit the industry and benefit society in general. Contains Tog's insights on a wide range of topics from quality management to the meaning of standards, and responses to queries supplied by designers and developers.

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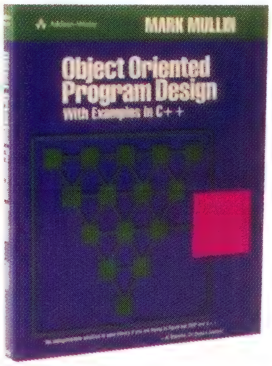

Object Oriented Program Design by Mark Mullin

- A concise guide to the essential concepts and techniques of OOP design
- Clarifies the key concepts of object oriented programming such as objects, classes, entities, hierarchies, and inheritance
- Uses typical database application to illustrate each OOP topic, to give the programmer a familiar poi of reference

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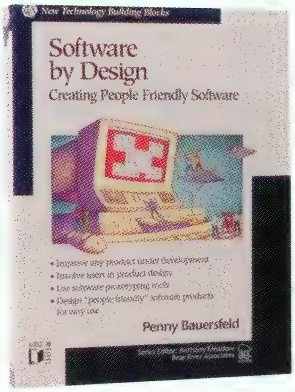
Software By Design: Creating User Friendly Software

by Penny Bauersfeld (Series Editor: Tony Meadow)


New Technology Building Blocks
Software by Design
Creating People Friendly Software
Penny Bauersfeld

- A thorough how-to for designing software that is easy to learn and comfortable to operate.
- Written from the Macintosh perspective, but compatible with all platforms.
- Stresses user input from initial design, through prototyping, testing and revision.
- Provides tools for analyzing user needs and test responses, plus exercises for sharpening user-oriented design skills.

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Inside Macintosh®: CD-ROM by Apple Computer, Inc.

- More than 25 volumes in electronic form.
- Includes: QuickDraw™ GX Library, Macintosh Human Interface Guidelines, PowerPC System Software, Macintosh Toolbox Essentials and More Macintosh Toolbox, QuickTime and QuickTime Components.
- Access over 16,000 pages of information with Hypertext linking and extensive cross referencing.

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Inside Macintosh®: Sound by Apple Computer, Inc.

- Describes the parts of the Macintosh system software that allow you to manage sounds.
- Contains information to write applications that can record and play back sounds, compress and expand audio data, convert text to speech, and perform other similar operations.

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Inside Macintosh®: Imaging by Apple Computer, Inc.

- Covers QuickDraw and Color QuickDraw.
- Includes general discussions of drawing and working with color.
- Describes the structures that hold images and image information, and the routines that manipulate them.
- Covers the Palette, Color, and Printing Managers, and the Color Picker, Color Matching, and Picture Utilities.

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Inside Macintosh®: QuickTime by Apple Computer, Inc.

- For developers who want to create applications that use QuickTime, the system software that allows the integration of video, animation, and sounds into applications.
- Describes all of the QuickTime Toolbox utilities.
- Provides the information you need to compress and decompress images and image sequences.

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Inside Macintosh®: QuickTime Components by Apple Computer, Inc.

Covers how to use and develop QuickTime components such as image compressors, movie controllers, sequence grabbers, and video digitizers.

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Inside Macintosh®: QuickDraw™ GX Programmer's Overview

- Provides an introduction to QuickDraw™ GX, providing an overview of the QuickDraw GX environment from a developer's perspective.
- Introduces the QuickDraw™ GX programming and runtime environments, the relationship between QuickDraw GX and the rest of the Macintosh® systems software and the relationship between QuickDraw GX and Macintosh applications.
- Learn the key elements of QuickDraw GX programming, data structures, object types, and functions used most frequently by QuickDraw GX developers are also covered.
- Provides a series of practical examples demonstrating how to approach programming with QuickDraw GX.

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Inside Macintosh®: QuickDraw™ GX Graphics

by Apple Computer, Inc.

- Shows how to create and manipulate the fundamental geometric shapes of QuickDraw GX to generate a vast range of graphic entities.
- Demonstrates how to work with bitmaps and pictures, and specialized QuickDraw GX graphic shapes.

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Inside Macintosh®: QuickDraw™ GX Objects

by Apple Computer, Inc.

Introduces QuickDraw GX and its object structure, and shows programmers how to manipulate objects in all types of programs.

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Inside Macintosh®: QuickDraw™ GX Printing by Apple Computer, Inc.

- Essential for any developer whose QuickDraw™ GX application supports printing.
- Shows how to support the new printing features of QuickDraw GX, including desktop printers and expandable printing dialog boxes.
- Shows how to use printing-related objects to add custom panels to printing dialog boxes and to create custom page formats.

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Inside Macintosh®: QuickDraw™ GX Printing Extensions and Drivers by Apple Computer, Inc.

- Essential for developers who want to create extensions to the application printing capabilities of QuickDraw™ GX, or who need to write a printing device driver that works with QuickDraw GX.
- Describes how to create printing extensions and printer drivers, and provides a complete reference to the messages, functions, and resources that they use.

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Inside Macintosh®: QuickDraw™ GX Typography by Apple Computer, Inc.

- Essential for developers who use QuickDraw™ GX to manipulate text.
- Shows how to use QuickDraw GX objects to handle all kinds of text – from plain, unstyled text to complex, mixed-direction and multi-language text with sophisticated stylistic and typographic variations.
- Shows how to create and manipulate the three different types of text shapes supported by QuickDraw GX including text shapes, glyph shapes, and layout shapes.

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Inside Macintosh®: QuickDraw™ GX Environment and Utilities by Apple Computer, Inc.

- Companion to QuickDraw™ GX Objects.
- Contains programming information useful to any developer writing QuickDraw GX applications.
- Describes QuickDraw GX memory management, error handling, debugging, and mathematical functions, as well as conversion from QuickDraw to QuickDraw GX.

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3D Graphics Programming Using QuickDraw 3D

by Apple Computer, Inc.

Includes CD-ROM!

- Incorporate spectacular 3D graphics into your applications.
- Explore QuickDraw 3D, a revolutionary graphics extension to the Mac OS for Power Macintoshes.
- CD contains the complete QuickDraw 3D system itself and a complete database of the QuickDraw 3D API, allowing you instant access to the hundreds of graphics calls via a fast viewing engine. Book/CD-ROM, 640 pages.

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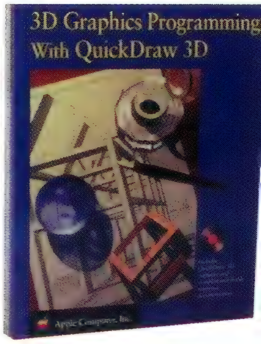

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3D Game Machine v1.2 by Virtually Unlimited

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- Create full "virtual" 3D worlds with six degrees of freedom, free-form texture mapping, shading, material and light properties, convex/cave polygons with unlimited vertices, unlimited light sources, dynamic hidden surface removal, special graphic modes for fast full-screen animation, collision detection, explosion simulation, 3D data importing.
- Simple easy-to-use interface. Runs on all Macs! Works with CodeWarrior.

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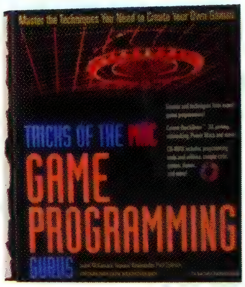

Tricks of The Mac Game Programming Gurus

- For beginning to expert game programmers
- Complete overview of all the necessary components of game programming on the Macintosh.
- Packed with valuable tools, utilities, sample code, CodeWarrior™ Lite and game demos.
- QuickDraw 3D and Power Mac optimization and inside info on how Glypha III was created.
- Hundreds of tried-and-true tricks, tips, and insider secrets from well-known Mac game programming experts

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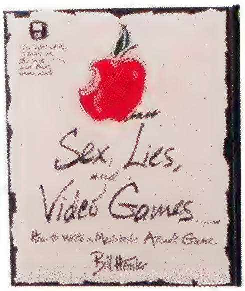
Sex, Lies, and Video Games
How to write a Macintosh Arcade Game
Bill Hensler

Sex, Lies and Video Games

by Bill Hensler

- A learn-by-example tutorial on the ins and outs of Mac arcade-style game programming in C.
- Features game theory, sprite animation, sound, and interaction techniques.
- A must-read for serious programmer's and hobbyists alike.

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Black Art of Macintosh Game Programming: by; Kevin Tieskoetter.

- Develop your own 3D games in C on the Mac.
- Includes CD with project files for both Symantec C and Code Warrior
- Create freeform texture-mapped games and polygon graphics
- Control dynamic source code-all compatible as native to the Power Mac
- Write directly to the screen, bypassing QuickDraw

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QuickTime Official Guide for Mac

- Includes step by step lessons and hands on advice to help you get the most out of QuickTime
- Customize the way you play QuickTime movies
- Digitize your own video
- Cut and Paste clips and add tracks to movies
- With CD that includes QuickTime 2.0, VideoShop 2.0.3, QuickFLIX 1.1.1, and MoviePlayer 2.0
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- Edited by Don Crabb

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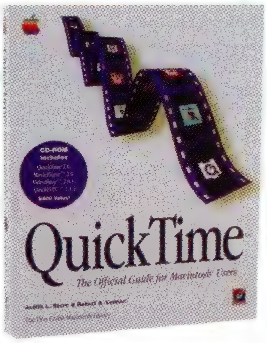

QuickTime Starter Kit For The Macintosh by Robert A. Lettieri & Judith Stern

- The ultimate package for getting productive and having fun with Macintosh movie-making
- Play, make, and edit QuickTime movies easily
- Loaded with tips on the best ways to bring live-action video to Mac multimedia
- CD-ROM includes QuickTime tools, movie clips, shareware, and demos of Premiere and other programs.

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Graphic Gems V Edited by Alan W. Paeth

- Loaded with practical tools for implementing new ideas and techniques, to offer working solutions to real programming problems.
- Contains over 40 new gems in ellipses, splines, Bezier curves, and ray tracing – displaying the most recent and innovative techniques in graphics programming.
- Includes a disk with source code from all five volumes. Available in both IBM and Macintosh versions. CONTENTS: Algebra and Arithmetic. Computational Geometry. Modeling and Transformation. Curves and Surfaces. Ray Tracing and Radiosity. Halftoning and Image Processing. Utilities.

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Advanced Color Imaging on the Mac OS

Includes CD-ROM!

- Enhance your software's color capabilities with step-by-step instructions.
- Augment the color support supplied with QuickDraw, and QuickDraw GX.
- Use the Pallette Manager to get the best colors on limited displays.
- Match colors between screens and input/output devices (scanners & printers)
- CD includes a complete reference information in both QuickView and Acrobat formats. Plus, a sample application demonstrating ColorSync programming techniques.

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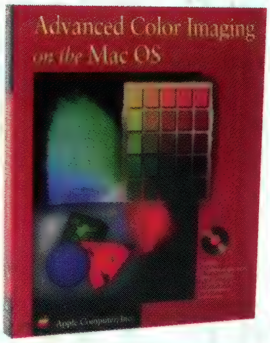

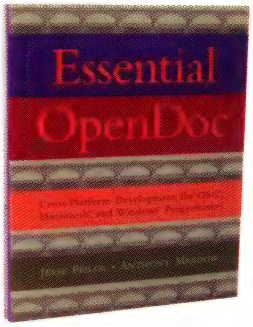
Essential OpenDoc
Cross-Platform Development for OS/2, Macintosh, and Windows Programmers

OpenDoc Programmer's Cookbook

- Shows you how to create OpenDoc software components, called parts editors, for the Mac OS Platform.
- Including instructions for setting up the Macintosh Programmers Workshop (MPW) development environment to write OpenDoc software
- Annotated listings of explaining the methods that implement the SamplePart part editor
- Descriptions of other sample part editors created by the OpenDoc engineering team to illustrate more advanced features
- Summary descriptions of software utilities provided with OpenDoc for the Mac OS
- An Introduction to the System Object Model (SOM) technology underlying OpenDoc

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Essential OpenDoc

- Gives an in-depth look at the technical issues of OpenDoc
- Explores the three core technologies that support it's functionality – SOM, OpenDoc's storage mechanism, and the Open Scripting Architecture (OSA).
- Also examines CyberDog, a set of OpenDoc part editors that provides access to Internet services and offers compelling example of the power of OpenDoc development

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Inside CodeWarrior 9

- Includes CodeWarrior IDE User's Guide.
- This is the printed version of the documentation provided on the CD.
- Covers CodeWarrior, the debugger, and associated tools.

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SEE RELATED CATEGORY: **Dev. Environments**

ResEdit™ Complete, Second Edition

by Peter Alley and Carolyn Strange

- Customize every aspect of your interface form creating screen backgrounds and icons to customizing menus and dialog boxes. 608 pages. Book/disk package.

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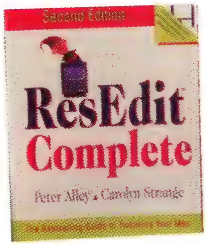

Inside PowerPlant Manual

- Create PowerPlant applications using the CodeWarrior IDE and PowerPlant Constructor.
- Full descriptions of major PowerPlant classes and resources.
- Included are the PowerPlant Constructor Manual, including View, TextTraits and Custom Types editing, and PowerPlant Library Reference, covering all classes and functions in PowerPlant.

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SEE RELATED CATEGORY: **Dev. Environments**

OpenDoc Programmer's Guide by Apple Computer, Inc.

- The official reference for the implementation of OpenDoc on the Mac OS.
- Describes the component software revolution and explains how to develop for it on the Mac OS platform.
- Accompanying CD-ROM contains a complete reference to the OpenDoc programming interface, and an extensive collection of tested, reusable sample code.

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C++ Programming with CodeWarrior by Jan L. Harrington

- Beginning OOP for the Macintosh and Power Macintosh and Mac OS compatibles.
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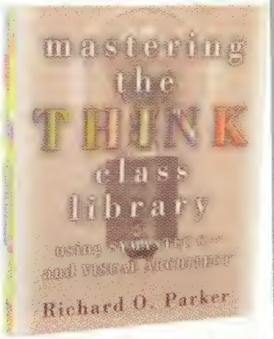

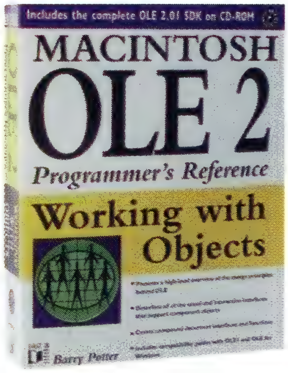

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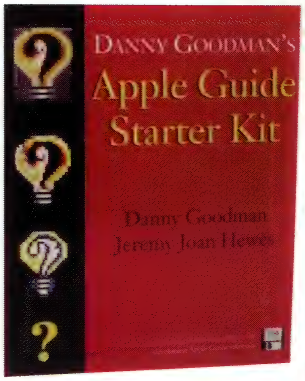

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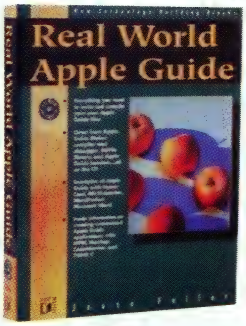

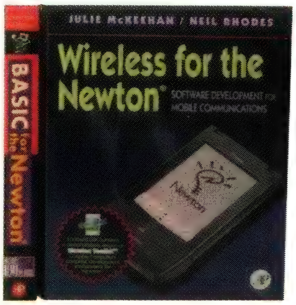

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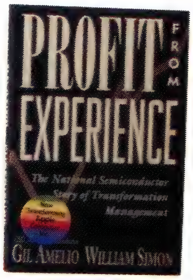
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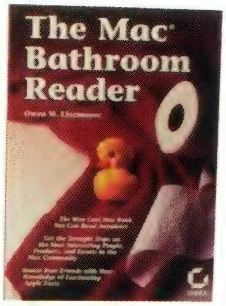

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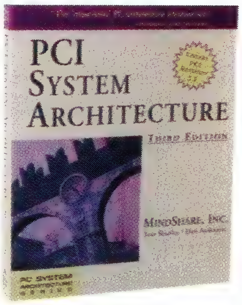

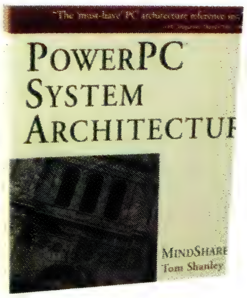

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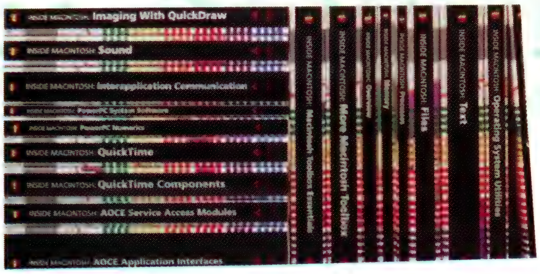
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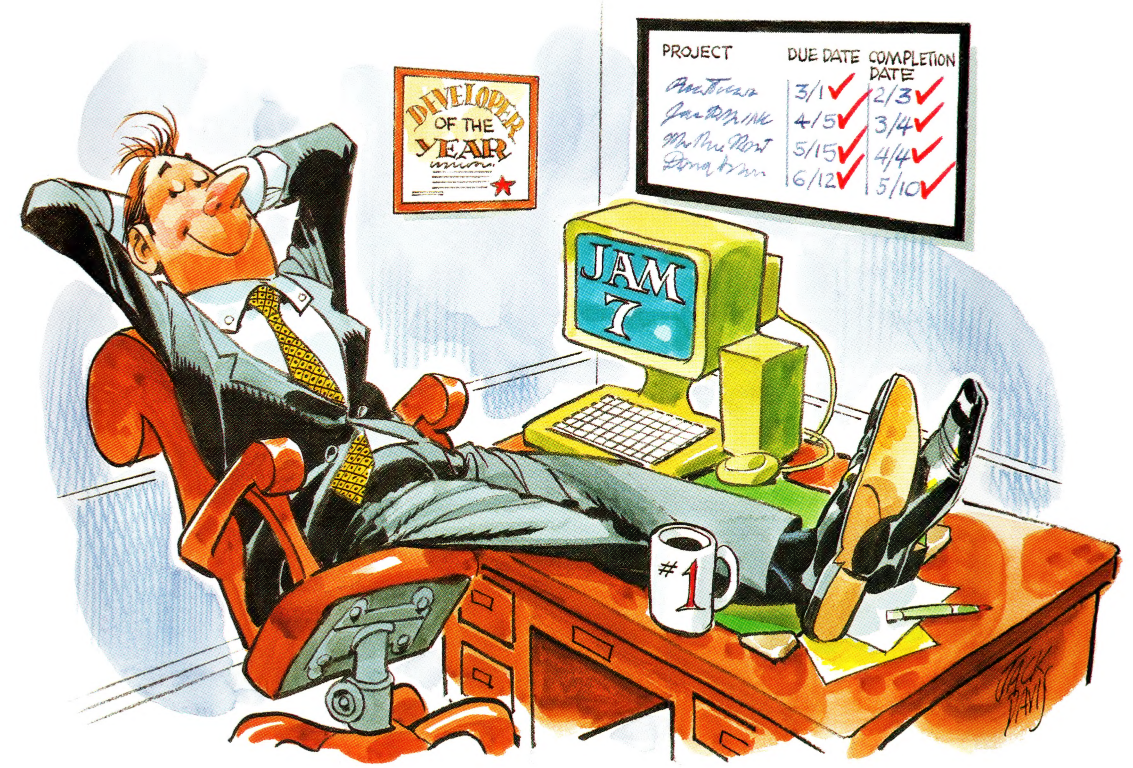

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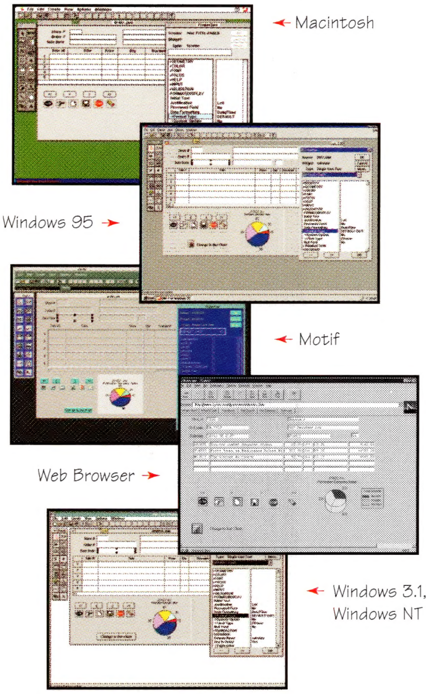

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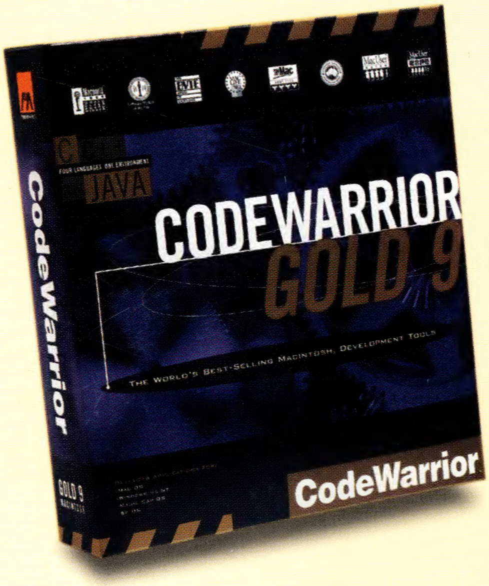

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